537.05
E38W9

PUBLICATION OFFICES:
168–177 POTTER BUILDING, NEW YORK.
Telephone Call: Murray 586. Cable Address: "Electrical," New York.

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Matter for the **Editorial** Department should be addressed to
The Editor of The Electrical World, New York.
Subscriptions and communications relating to **Advertising** or the **Business Department** should be addressed to
W. J. JOHNSTON, Publisher,
Potter Building, New York.
OR EITHER OF THE BRANCH OFFICES.

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Vol. VIII. NEW YORK, NOV. 27, 1886. No. 22.

THE most efficient mode of street illumination may well claim the attention of those who furnish the many arc as well as incandescent lamps now employed out-doors, and some simple device adapted to the purpose ought to be well received. Such a one appears to be that illustrated in another column, which consists of two lenses placed on either side of the lamp. The gas interests have learned considerable from the electricians in late years, and hence they ought not to begrudge them the appropriation of a trifle originating with them.

THE modern methods of conducting newspapers have been greatly changed by the increase in telegraphic facilities, but it is difficult to conceive even now that a daily newspaper can be edited by cable. Yet such appears to be substantially the fact, if the account given in another column can be credited. Not every editor, however, can rejoice in the ownership of an Atlantic cable, and while sojourning in foreign lands maintain daily, extended communication with his home office, but the fact is worthy of note as indicating the far-reaching influence of rapid means of communication.

THE stoppage of the illumination of the Statue of Liberty, which has given rise to so much unfavorable comment in many quarters, was, we are glad to state, only a temporary one. Mr. Goff, with his characteristic energy, having brought the matter personally to the attention of the President, steps have been taken to make the installation permanent in its operation. It seems a pity that a work begun under such auspicious circumstances should have been allowed to become a matter of reproach, but we may find consolation in the hints which are prevalent that the lighting of the statue will be improved and some of the defects noted removed.

ONE of the many uses to which electric motors can be put is the raising of elevators for both passengers and freight. Modern practice has, however, manifested itself strongly in favor of the hydraulic elevator on account of its smoothness of action, and hence some have thoughtlessly argued that the electric motor could find no application where that type of elevator is employed. A note in another column shows the erroneousness of the idea, and proves that the electric motor is probably the most convenient which can be employed for the purpose. Operating only when required to fill the tanks, it obviates the necessity of having a large steam plant in buildings, the pumps being connected directly to the motor receiving current from a central station.

AFTER repeated admonitions, the New York Aqueduc Commissioners have taken steps to compel the contractors to employ the electric light in the tunnels. This action is worthy of comment, as it shows the strong claim which electric illumination has to general recognition on sanitary grounds. Underground workings are never too well ventilated, and when to the ordinary discomforts met with, that of bad air, caused by the use of gasoline lamps, is added, it would seem but an act of humanity to employ the electric light in such situation. It seems, however, that the law must be invoked for the purpose. It is but just to remark, however, that the electric light has already been installed to a considerable extent in the aqueduct workings, and that the complaint is directed against only two of the contractors engaged on the work.

TRUE to their threat, a large majority of the telephone subscribers at Rochester have ceased to use their instruments, as a protest against the increase in rates demanded by the telephone company. The latter claim in effect that the old rate was determined upon at a time when the business was new, and that future developments have shown their original estimate of profits to be erroneous. If the statement made by the superintendent, which is given in another column, is to be accepted, the investment is decidedly a poor one. Stress is also laid upon the fact that, contrary to the general law of business, an increased number of telephone subscribers does not necessarily mean a corresponding increase in revenue. The subscribers, however, naturally do not propose to submit to the proposed change, and speak of taking measures to prevent its consummation. One of these consists in invoking the aid of the State, and another in the calling in of other telephone companies. We have always held that State interference in these matters is pernicious, and, considering the present state of telephone litigation, we can not see how another telephone company could hold its own. We believe that arbitration, as suggested, would be the best manner in which to settle the difficulty, and hope soon to see the Rochester subcribers again using their instruments.

THE reports presented at the annual meeting of the Telegraphers' Mutual Benefit Association in this city, last week, show that the past year has been a very prosperous one for the Association. The membership in the first division has increased from 2,872 to 3,188; from which, deducting the number of memberships lapsed during the year, 64, and the number who died, 22, leaves the net membership at the end of the fiscal year 3,102, being a net gain during the twelve months of 230 members. The increase in the second division has been in even a larger proportion. The amendment to the by-laws passed at the annual meeting is an important step in the right direction. It is undoubtedly unfair as a business proposition that those joining the Association at the age of 40 or 45 should be on an equality as regards assessments with those who join at the age of 20 or 25. It is no easy matter to deal with the affairs of an association of this character, which is not intended to be run too closely on business principles, but is also benevolent in its character. It is well, however, for the members not to lose sight of the fact that whatever amendments they make to the constitution and by-laws should be in the direction of insuring the permanence and stability of the Association, and the adoption of the graded assessment plan is certainly a move in that direction. The question of paying commissions to agents is a matter concerning which much might be said *pro* and *con*. On the one hand, there seems to be no good reason for paying out money for services that members are perfectly willing to render gratuitously. Such a course directly increases the cost of insurance, and it ought to be the aim of those having the affairs of the Association in charge to make as few assessments as possible. On the other hand, however, there are instances where the judicious payment of commissions would prove a good investment for the Association, by increasing its business and insuring the best efforts of agents who otherwise might not feel that they could afford to devote so much time and attention to its affairs without receiving some remuneration for their services. The resolution adopted will enable the Executive Committee to give the matter a practical test during the next year. At the end of that time it can probably be very readily determined whether it will be to the interest of the Association to continue the practice of paying commissions. The officers and members are to be congratulated on the vitality of the Association after its many years of usefulness, and on the wise and conservative action at the recent meeting.

WE have recently had occasion to advert to the rapid strides which have been made in the direction of increasing the working capacity of telegraph and telephone lines, and this week we chronicle another decidedly novel and practical method by means of which three messages can be sent simultaneously over a wire in either direction. Mr. Field, by simple means, arrives at excellent results, not the least interesting of which is the total abolition of all galvanic batteries, including even the locals. Of course, such an installation would probably only be applied in the larger centres of population, where the demands of traffic would warrant the enlarging of the capacity of wires, but even with these conditions the field of its application is a large one. While the dynamo is employed, the power required is very small, and in the trials we witnessed a small petroleum engine of one horse-power was amply sufficient to drive both the former and the small generator for actuating the vibratory receiver. When we consider the great expense and inconvenience attending the use of batteries, it seems strange that their employment is continued in large telegraphic centres. It is true that dynamos are employed for ordinary telegraphic purposes in a few isolated cases, but certainly not to the extent which the benefits derived from their employment would warrant. Perhaps the reason for this is to be found in the fact that the idea is comparatively new, and that the profession at large requires education in their successful application.

TAKING into consideration the fact that incandescent lighting had its origin in this country and that its spread here has probably been greater than in all other countries combined, it would be but natural to suppose that the art of incandescent dynamo building had been at least as fully developed here as in other countries. Such, however, does not seem to be the opinion of an English contemporary which maintains "that at the present moment the most perfect incandescent light dynamos are produced in England. As regard arc lighters, we are in fairness bound to admit the superiority of American designs; but for incandescent lighting and for motive power purposes, we claim the lead." So far as this statement refers to arc machines, we are willing to accept it as true, but this very admission casts a doubt upon the accuracy of the rest, and which we think can also be entirely refuted. Indeed, we are at a loss to know from what source the inference could be drawn that our incandescent dynamos are inferior to the English. The comment above quoted is introductory to a description of a French dynamo, the details of construction of which are criticised by Mr. R. E. Crompton, in another column, who compares the machine described with those of English make. The table which he gives, showing the performance of English dynamos, furnishes us with a ready means of drawing a comparison with dynamos of American manufacture, and excellent as are the results there shown, they certainly do not exceed the results obtained on this side of the water. We base our comparison on the tests of dynamos made by the Franklin Institute, which are probably the most complete and reliable to be obtained. These tests were made with four sizes of Edison and three of Weston incandescent dynamos, and the results obtained showed the average efficiency at full load for the seven machines to be 95.6 per cent., the lowest efficiency of any single machine being 94.45 per cent. Comparing the five best machines of different makers given in Mr. Crompton's table, we find their average efficiency to be only 93.4 per cent. So far as averages go, therefore, the inferiority of American dynamos is purely imaginary on the part of our contemporary; in fact our machines show a decided superiority. But comparing even individual machines, we find nothing which would warrant the assertion to which we have taken exception. For, the two best English machines are put down as having an efficiency of 96 per cent., while of the seven machines tested by the Franklin Institute two each of the Weston and Edison types exceeded 96 per cent. in efficiency. No further proof, we think, is necessary to show that we have kept pace with the march of improvement. Indeed, Mr. Crompton remarks truthfully that dynamo building in America, as well as in England, has been developed to "standard practice." With the rapid development of incandescent lighting in this country it would indeed be anomalous if no standards had yet been settled upon.

The Telephone Troubles in Rochester.

With regard to the troubles over increased telephone rates in Rochester, Mr E. J. Hall, Superintendent of the Bell Company, has made a statement to the people there, in which he says:

"Let me dispose of the mistaken idea that the company I represent is connected with the American Bell Telephone Company, of Boston. We have nothing to do with that company or its profits, except to the degree that we are obliged to pay it for a license. As to our own company, it has a capital stock of $600,000, about one-fourth of which, or about $150,000, is represented in the Rochester investment. On that investment it is charged we are, by the exacting of exorbitant rates, making between $40,000 and $45.000 a year. If we were making that profit in Rochester, it would be a princly income from the investment; but the fact is that the actual profits received by our company from its Rochester exchange between Jan. 1, 1886, and Nov. 1, 1886, a period of nine months, were $5,585.89, and of this amount $3.204 represents receipts—not from telephone rentals, but from toll message service in and out of the city. In other words, the sum of $3,204 was received at Rochester for long-distance telephone service, leaving a balance of $2,381.89 as the net profits of the Rochester exchange proper for the period named. I shall be happy to show any authorized committee of our Rochester subscribers a detailed statement from our books of the receipts and expenditures on the exchange in this city. The company is ready to stand or fall by the statement I have just given, and invites scrutiny into its absolute correctness. Now, the company was not organized for a benevolent purpose, but purely as a business enterprise. It seeks to obtain a fair profit on its investment. To secure such a profit, it became necessary to charge in Rochester a flat rate of $75 per annum or to introduce the message system. An objection urged with some heat against the new rates is based on the argument that the company promised in the first place to reduce rather than increase its charges, and that, having waited until the telephone service had become almost a business necessity, it is now taking advantage of the situation to squeeze its subscribers.

"Now, I am free to say that the telephone men were, at the start, off in their calculations. It was a new thing to them as well as to the public. They believed that the larger the exchange became, the cheaper would be the cost of service; but experience has proved that the case is exactly reversed. In a small town, with a correspondingly small exchange, one boy or girl can attend to 200 wires, whereas an operator is required for every 50 wires in an exchange like that in this city. The cost in other directions increases in like ratio. The item of contingent expenses is another serious consideration. For instance, a single sleet storm may cause us in the city damages to the extent of several thousand dollars. The wet snow in Buffalo last Saturday entailed an outlay of $500 on account of broken wires, while the same storm cost us not more than $20 for repairs to the country lines. In short, we know that we cannot afford to conduct the Rochester exchange on the old plan, and, as I have said, we were forced to advance rentals to a flat rate of at least $75 a year or adopt the message contract plan. Sure of our position, we should have been glad to meet and explain the situation to such of our subscribers as could not see the justice of the change. But the gentlemen who are representing our Rochester subscribers have, so to speak, struck without even sending a committee to notify us of their wishes and to hold a conference on the subject. Much fault is found with the Knights of Labor for hasty action in disputes with capital, but the Knights seldom fail to appoint a committee of conference before taking decisive action. In more than one city where telephone wars have been threatened, a full and candid interchange of ideas between the representatives of the company and the subscribers has avoided all trouble. Why should not the same course be followed in the present case?"

A dispatch from Rochester of Nov. 16 says: The subscribers of the Bell Telephone Company had a meeting last night and formed an organization "to secure State and municipal legislation that will control the company and protect people's rights." The meeting was largely attended and was very enthusiastic. About 600 subscribers resolved to order out their telephones at noon on Nov. 20 if the company persists in the advance of tariff. This will practically kill the Bell Company in Rochester, as the 600 names represent about all the business men who use telephones, while those in private houses will be rendered useless Officers were elected, committees appointed, and a constitution and by-laws adopted. This is the first decisive and definite movement made by the indignant telephone subscribers of Rochester, and unless some agreement is reached and hostilities suspended within five days, telephone service in this city will be entirely suspended. Ex-Congressman John Van Voorhis believed the telephone companies in this State incorporated under the telegraph statute of 1848 illegal and their charters worthless, on the ground that their corporate powers were obtained upon a flimsy and loose interpretation of the statute.

A subsequent dispatch from Rochester, of Nov. 20, says: At noon to-day 750 subscribers out of 900 carried their threat of discontinuing the use of telephones into execution, and their intention was carried out with all the care and attention to detail of a well-organized strike. Precisely at 12 meridian the huge foghorn on Kimball's tobacco works, which can be heard over a mile, was sounded, and the sound was prolonged to a degree that made people on the street who did not know the cause of the disturbance stop and wonder what was the matter. The deep intonation of the foghorn was the signal for steam whistles all over the city, and these were immediately sounded in dozens of shops and factories. The result was a genuine sensation all over the city. No one of the striking subscribers could plead ignorance or forgetfulness, as the unearthly noises recalled to the minds of all that the hour was come when a determined stand at what Rochester people are calling the encroachments of monopoly should be taken, and it was taken. So far as known there is not a single subscriber who failed to carry out his agreement. The majority of them disconnected their 'phones by taking out a plug or cutting a wire.

There has been little or no telephonic service in this city this afternoon. At the exchange all has been idleness. The score or more of the girls whose duties are to make connections could be seen looking out of the windows and gazing at the pedestrians on the street. They did not seem to be at all unhappy, but rather enjoying the lull in business. The managers of the local branch were reticent as to the troubles, and would say nothing more than that they considered the fight a one-sided one, with all the advantage on their side, and that it would be only temporary. Their argument is that the people of Rochester cannot get along without their telephones, and that after a few days, or possibly weeks, of the inconvenience resulting from no service, they will one by one fall into line again and resume the use of their instruments. Of course, they are sanguine from precedent, for they had almost a similar fight with Buffalo subscribers some time ago. In that fight they were successful, and they of course expect the same result here. On the other hand, the striking subscribers take an entirely different view of the situation, and say that they will stand firm until they have gained their point. All are pledged to stand together, and for any one or more of them to yield will mean ostracism by the rest.

Many business men were loth to agree to the strike until they had the assurance that their business competitors would do the same. So the canvass was conducted by lines of trade, and the result was satisfactory. The result of the present fight is, of course, doubtful; but, at all events, no one of the Bell Telephone companies ever encountered a more determined and obstinate resistance than the present company is now experiencing from the citizens of Rochester. A permanent association has been formed, known as the Citizen's Telephone Association of Rochester. Dues and subscriptions are exacted, and these funds are to be used to secure legislation, both from the city and State, for the purpose of defining the rights and powers of all similar monopolies. Locally, they are, of course, working for themselves, but they will make a test case before the State Legislature which will settle the matter for the whole of New York.

Probing the Mysteries of the Lowell Syndicate.

The legal battle which has been going on for a long time between the Erie Telephone Company and some of its former officers has been resumed at Lowell. The present suit is one brought against the company by three of its former officers to recover a large amount of money alleged to be due them for services. After an adjournment of over four months, the hearing of the case was resumed on Wednesday, Nov. 17.

Charles J. Glidden, till recently treasurer of the Erie Company, was examined by General Butler. A great mass of evidence with regard to the transfer of the Southwestern Company, of Arkansas, to the Southwestern Company, of New York, showed that at a meeting of three directors they accepted their own resignations and appointed their own successors. General Butler claimed that the transfer was illegal, as the deed was not sealed or witnessed.

The Cleveland company purchased for $412.500 capital stock originally worth $150.000. The capitalization was first $1,000,000, and was later increased to $1.500,000. The cash profits for seven members of the syndicate were $377 500 The profit of William H. Bent, now suing for services as attorney on the transaction, was $50,000. To Messrs. Vail and Madden, the manager and assistant manager respectively of the American Bell Telephone Company, $30,000 was paid out of the profit. The capital of the Cleveland, Northwestern and Southwestern companies was $210,000. This was swelled to $5,000,000, of which $2,000,000 was kept in the treasury.

The deposition of A. S. Temple, agent in the Dakota purchase, was then read. He deposed that he took no stock in Glidden, Ingham and Downs, as they had all told different stories to him. He was discharged from the management of the northwestern division of the Erie company because of a shortage in accounts. A letter purporting to bear his signature the witness declared a forgery.

Mr. Glidden was again placed on the stand by General Butler, and testified that he had put $75.000 into the Dakota deal instead of $100,000, as stated previously by him. The witness was secretary and treasurer of all the telephone companies. There was a general agreement made that no officer should charge for services. Bent, Ingham, Downs and witness were present when agreement was made that the officers should make no claim for salaries for services rendered Erie. The reason for not claiming salaries was that they were drawing pay from the four old companies in consolidation, and that a "handsome deal" had been made Afterward witness took salaries from the Erie Company without knowing it, although the books of the company were in his charge. It had slipped his mind "that salaries were included in expenses." Witness testified that the Dakota property was purchased at $70,000 and considered a good investment. It was then paying 10 to 15 per cent. In response to the request of the Bell Telephone Company, the Dakota was turned over to the Northwestern to be managed. It was afterward sold to the Erie at a profit of $7.000. Loren S. Downs bought the Arkansas property, and it was put into the Erie company at $50.000. Extracts from the syndicate "pool" book were read, showing the various transactions. Among the items was one for $119.75 for fireworks for July 4, and a $10 contribution to the newsboys. A present of $1,000 was made to E. P. Varney, of Manchester, N. H., out of the pool, with the consent of Ingham, the others of the syndicate knowing nothing about it. The Lowell District Telephone Company was organized by Ingham, Soper, Grafton and witness: capital, $15.000; in six months it increased to $30,000. When the capital was increased in August last, it was because it was thought that the dividends were too large for the capital. The only increase not made on the basis of earnings was that made in order to pay the Bell Telephone Company 30 per cent. for a perpetual franchise.

In his cross-examination the following day, Mr. Glidden testified that the capital of the National Bell Company of Maine was first increased to $500,000, $100,000 of which was in the treasury. It was then increased $500.000. For this company Mr. Bent was attorney, and received pay for his services. In 1883 the company was consolidated with the New England Company, under a plan submitted by Mr. Vail, of the Bell Company. Among the syndicate that purchased the Northwestern were Messrs. Ingham, Downs, Glidden, Saunders, O. E. Madden, William H. Anderson, J. F. Kimball, Paul Butler, Dr. M. G. Parker and Paul Bonney. The profit on the investment was 33 per cent. Bent also acted as attorney for the consolidated companies, and was paid for his services.

There was a shortage of $40,000 in the accounts of the Northwestern Company at the time of the consolidation. The Southwestern Company, however, had a cash balance. The Northwestern Company is kept alive because the Bell Telephone Company will not recognize the Erie. The Erie Company claims that in several contracts they have perpetual rights. At the time of the consolidation the capital of the Erie Company was $5,000.000, $4,800,000 of which was issued. Mr. Bent loaned $8,000 or $10.000 to the Erie Company at various times. All that Bent demanded, $7,000, had been refunded.

Upon redirect examination by Gen. Butler, Mr. Glidden testified: "The Dakota and Arkansas companies cost $137.000. No officer of the company ever examined the property. Reliance was placed upon the statements of Dyer, who had no previous experience in telephone matters."

"It turned out," claimed Gen. Butler, "that over one-half of the telephone subscribers reported were dummies."

Witness continued: "The profit on the sale of the Dakota and Arkansas companies was $32,000. Thinking that they had not done right with this money, it was refunded to the Erie Company."

By a question it was ascertained that $77,000 was appropriated by the directors for the purchase of the Dakota and Arkansas companies. The bill of sale called for but $70,000. The remaining $7,000 was divided among the syndicate, Dyer and Temple receiving $1,000 each. In order that the money might be accounted for, a receipt for $7,000, purporting to be signed by Dyer and Temple, was put in as a voucher. These signatures have been declared a forgery by Temple.

William H. Bent, recalled by the plaintiff's counsel, testified that at no time did he state, or hear it stated, that for the services which he was rendering, or would render, to the telephone company he was to make no demand for compensation. Treasurer Glidden made a miscalculation as to the condition of the companies entering the consolidation. He said that they would pay dividends, but instead of this the Maine Company's receipts were less than its liabilities. Mr. Glidden was censured for faulty book-keeping by the witness, who told him that if he could not keep the books better than that he ought to make up the deficit from his own pocket. It was then decided to withdraw the salaries of the officers to cancel therewith a portion of the deficit.

Both sides then rested the case, and the arguments followed.

* **Electric Lighting of Trains.**—Electric lights have been used for three months past in a dining car running between Paris and Brussels. The electricity is supplied from the constant batteries of Desruelles. Forty-five of these in fifteen boxes, weighing nearly 1,400 lbs., are attached under the car. They are said to afford light for 70 hours to 21 lamps, with 100 aggregate candle-power. The light is very steady for the first 20 hours, and then begins to grow weaker.

New Underground Work in New York.

At the meeting of the Subway Commission held on Nov. 16, Dr. Ledoux, the chemist, reported that he had received no samples of perfected paper tubes from the Averell Company, but that, at the request of Engineer Kearney, he had examined samples of zinc tubes, and he saw no objection to using them on the Fifty-eighth street section. Engineer Thomson, of the Construction Company, thereupon announced that the company would furnish the tubes, and that he would advertise for bids for asphaltic concrete for the mastic of the conduit.

The Commission adopted this plan, and it was regarded as a set-back for the Averell Company. Engineer Kearney admitted that the Averell Company had sent in a sample conduit to him, but said that he had not had time to examine it. Commissioner Gibbens insisted that he should make a report on the Averell system on Friday. It was reported that the application to the Park Commissioners for permission to run the Brooklyn Bridge section through the City Hall Park would be acted upon at once.

Engineer Thomson, for the Construction Company, asked permission to lay a conduit in One Hundred and Twenty-eighth street, from Third to Fourth avenue, and thence up Fourth avenue to the Harlem River, to the Western Union cable house, in order to make connections with the Western Union cables strung on the Third avenue elevated structure. Superintendent Brown cheerfully acquiesced in the demand of the Commission that the poles should come down on these few blocks, for, with the other short conduit from the Brooklyn Bridge to the Western Union offices at Dey street, that company has now accomplished what it desired. The conduit is to consist of six iron tubes embedded in hydraulic cement, and work is to be begun as soon as possible.

Mr. Beckwith, in speaking for the Metropolitan Telephone Company, said that it had ordered cables and would lay them in the Sixth avenue conduit, and that after the cables had had a good, long test this winter, if they proved satisfactory, the company did not expect to keep up its poles. Mr. Beckwith was very guarded in his utterances. The Metropolitan Telephone Company also sent in a number of applications, in regard to privileges for Cherry and Hester streets. Commissioner Gibbens objected to this, and asked that investigations be made to see if a conduit could not also be laid on that route.

In the Superior Court, Chambers, on Nov. 16, Judge Ingraham denied the motion of the New York Underground Telegraph Company for an injunction to restrain the police from arresting its servants for undertaking to open the streets for the purpose of putting electric wire conduits down without the approval of the Subway Commissioners. The motion was based on the ground that the police were only empowered to make arrests for crime, and that as it was not criminal for the telegraph company's servants to open the streets, under a permit issued by the Department of Public Works prior to the establishment of the Board of Subway Commissioners, they should be restrained from arresting them. Judge Ingraham held that a court of equity had no authority to restrain the police from arresting a person charged with the commission of an offense, nor in any way to pass upon the guilt or innocence of such a person, the determination of that guilt or innocence being the duty of a criminal court after arrest.

At the meeting of the Commission on Nov. 19, Mr. Kearney reported that the Construction Company was carrying out its instructions for the Fifty-eighth street conduit, but that no report on materials could be made till the next meeting. "We must have some expedition," said President Hess, "and the Commission will insist that the work shall begin a week from Monday."

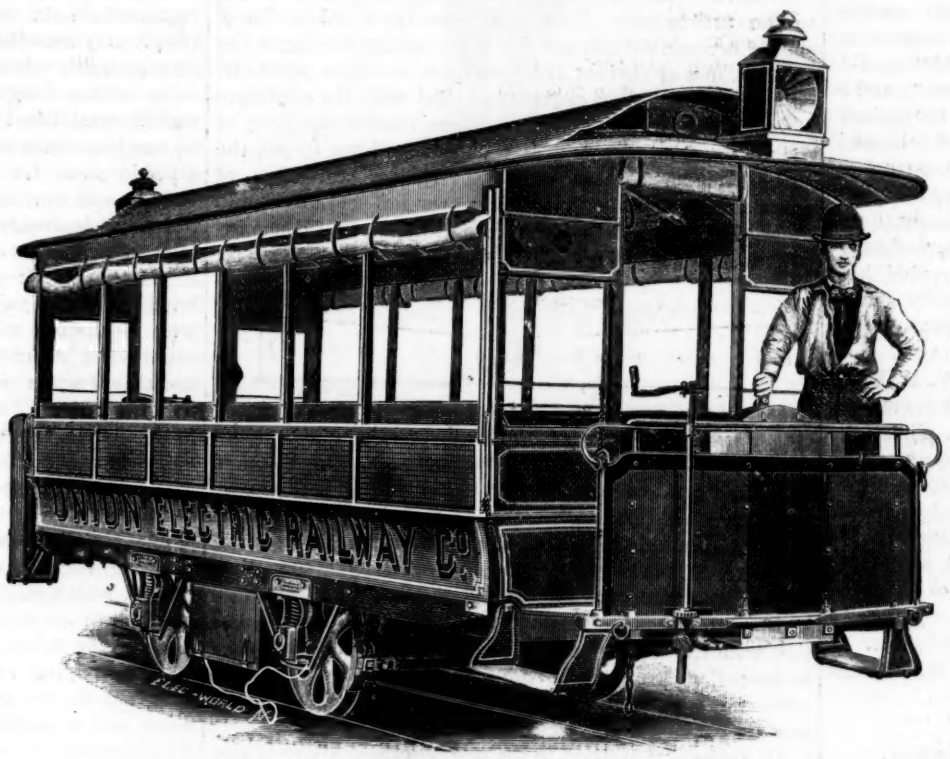
Mr. Kearney then said: "The Sixth avenue conduit will be completed on Monday, and it remains for the Commission to decide whether any more of the Dorsett sections are to be used." He suggested Twenty-first street as the most available spot.

Commissioner Gibbens immediately asked that the question be laid over until the next meeting, so that the engineer might report. Mr. Kearney said he didn't know what he was to report on. Commissioner Moss said he understood that the Dorsett Company had shut down to overhaul their machinery, and if they were not ready, he did not propose to give them a contract. Mr. Samuel Hess jumped up for the Dorsett Company, and said that they had conduits enough completed for six blocks. Commissioner Hess thought that the Construction Company ought to be consulted. It was claimed that the Commission had the power to decide on the system, but the matter was laid over. The Commission was unwilling to condemn the system, and thereby release the Construction Company from its bond, and the Construction Company showed no desire to stultify itself by denouncing its past action. Lawyer Lauterbach did not put in an appearance.

The permission of the Park Commissioners was then read, granting the use of Mail street for the Brooklyn Bridge section, but refusing passage through City Hall Park. President Hess brought to the notice of the Commission the action of the United States Illuminating Company, which, after being refused a permit, erected a pole in front of the Casino at 4 o'clock on the morning of Election Day. The matter was ordered to be presented to the Superintendent of Police, so that he might be on his guard for the future. The application of the Western Union Company to string six wires on Twenty-fourth street and eight wires on Wall street was given to Commissioner Gibbens for investigation. The meeting then adjourned.

The Electric Tramcar on Ridge Avenue, Philadelphia.

The electric railway which has been in operation on Ridge avenue, at Philadelphia, has already been mentioned in these columns. It will be remembered that it forms part of the system designed by Mr. Wm. M. Schlesinger, electrician of the Union Electric Co., of Philadelphia, and described in our issue of Oct. 30. We are enabled this week to present an illustration of the car which has been employed. The latter was an old, open, summer car, and weighs, with motor and appliances, 7,000 lbs. It has seating room for 30 passengers, but has carried as many as 90 at one time. The motor is fastened underneath the body of the car, between the two axles, and is geared to the latter by means of chains. It is capable of developing 14 h. p.



THE SCHLESINGER ELECTRIC TRAMCAR AT PHILADELPHIA.

The regulating appliance is on the front platform, and consists of a flat box, having one lever only. When this latter stands in the middle position, as indicated in the engraving, the car stands still. On moving the lever to the right, the car is propelled forward; on moving it to the left, backward. The greater the distance to which it is moved from the centre, the greater the speed. The car is furnished with a powerful electric brake, is lit up by electricity, and carries two strong head-lights. It has been in daily operation for the last four months, running at an average speed of 9¼ miles an hour. The current is conveyed to it by means of conductors placed in a conduit, of which we have already given details.

About Boston Telephone Exchange Operators.

In some notes about town, "Tavemer" describes in the Boston *Post* a recent visit of his to the local exchange. The matter contains nothing of special novelty, but a good point is made with regard to the operators, as follows:

"These seem to be young women of excellent physique," I said to the superintendent, Mr. Carty, as he invited me to a chair by his desk. "We insist upon that," said he; "we have found that girls of good physique, healthy young women, are much less liable to irritation and impatience, much less likely to 'get rattled,' than those who are a little weak or ill. It is not that the work wears upon them, so that only women of unusual physique can stand it, but that we must have operators who are likely to keep their tempers and maintain coolness of demeanor. Does it deafen them? I have never known but one case of an operative's hearing being affected, and that might easily have been from some other cause. They do not seem to suffer much nervously, though there was one case of hysteria here last week. One of the girls—that one with the slender figure and dark hair near the end of the line—got confused and 'rattled,' as we call it, over a series of vexations, and asked to have a substitute placed in her chair. You see that we keep five substitutes in the room to relieve those who desire to be relieved at any time. Well, this young woman went into the girl's waiting-room and had an attack of hysteria there. Not infrequently something occurs on the line—somebody gets impatient and loses his temper—which troubles the girls. They generally go out into their room and have a good cry, and come back feeling better. They certainly seem to like the work, though the pay is only $7 a week. The hours are not long; they sit all day; they are relieved when it is needful, and the actual work seems to be agreeable to them.

"We like to have people who have telephones come up here," said the superintendent; "it gives them an idea how the thing is done, and we notice that they seldom get impatient in the use of their telephones afterwards."

Editing by Cable.

In a recent sketch of James Gordon Bennett, a newspaper correspondent says, with reference to the editor's prolonged absences from America:

People who picture an editor close to his compositors and staff and in the same building as a journalistic necessity, are forgetful of such things as telephones and cables, and that by these, always, if he can afford to use them liberally, an editor can be as near to his employés as if they were connected by electric bells and speaking tubes under one roof. It is a nice question for argument whether, if constantly informed by cable messages of what constantly transpires at the place of publication, one cannot at any distance be more calm in judgment and more correctly thoughtful than if he were in the midst of newspaper turmoil and excitement. The best intellectual managers have been the best lovers of and participators in life's pleasures. The American critics ignorantly harp on Mr. Bennett's pleasures and say nothing of his labors.

I understand reliably that each day's *Herald*, while he is nigh to cables and telegraphs, is as well acquainted with Mr. Bennett as Mr. Bennett is with it, and each as much as if he resided in New York. Distance is now relative. An editor can direct his paper as well from Paris, or Aix-les-Bains, or Nice, or Constantinople, as if he were at Newport or Bar Harbor. Every morning a cable dispatch goes to Mr. Bennett from his managing editor, who was nurtured as a boy in the Herald office and has grown to middle age with it, which dispatch summarizes what the other morning papers publish or discuss, and what seemed to be the prominent events of the day—what is doing at Washington or Boston or Albany, or in the great Eastern, Western and Southern centres — and each day Mr. Bennett, by cable, returns some hints, advice, views, comments and instructions. By similar means he knows daily whatever is going on in his newspaper business.

Every day he is informed as to the circulation that day of his paper and its prosperity, likewise the situation of its rivals.

His business manager is Gardiner G. Howland, of the old firm of Howland & Aspinwall, between whom and himself exists not only business intimacy but the friendship of boyish companions. Both of these believe in the maxim that "Economy is wealth." Between them are few, if any, leaks. Mr. Bennett has his main bureau in London, within biscuit throw of his Bennett-Mackay cable office, and within pistol shot of every cable office known in London. He has salaried correspondents in Dublin, Queenstown, Edingburgh, Liverpool, Madrid, Berlin, Vienna, St. Petersburg, Rome, Constantinople, etc., and time and space residential reporters at nearly every prominent place in Great Britain or on the continent. He personally superintends their employment. Every mail brings him pounds of clippings from American newspapers by his exchange editors. These are carefully arranged under headings, such as personal, journalistic, *Herald*, national politics, local politics, state politics, finance, railroads, etc., etc. Probably his European and American cables, personal or newspaper, cost him $100,000 a year. Much of this is the penalty of living abroad.

The Electric Light in Berlin.—The annual report of the gas works in Berlin contains some interesting facts about electric light installations. In all there are 152 installations in Berlin, containing 736 arc lamps and 12,705 glow lamps. Gas engines are used in thirty installations, and the rest are either worked from central stations or use steam power on the premises. The Städtische Elektricitäts Werke have alone 5,499 glow lamps and 27 arc lamps in use.

Inner History of the Subways.

Much interest is felt in New York electrical circles, in the bill in equity filed in the United States Circuit Court last week by W. McMahon, of Rahway, N. J., against Maurice B. Flynn, Justice W. H. Kelly, the Subway Construction Company and the Dorsett Company.

The bill claims to present the history of Maurice B. Flynn in connection with the Subway Commission and the growth of the Consolidated Telegraph and Electrical Subway Company, ordinarily known as the Construction Company. William McMahon is known as a man of some property, who was the Democratic candidate for Congress from the Third New Jersey District at the late election. His New York office is in the Boreel Building. this city. He sets forth in the bill that he has been familiar with the various electrical subway systems, and that he himself has patented many devices in that direction. He declares with simple candor that he is also familiar with the methods usually adopted to gain the attention of investors in enterprises of this character. Flynn and Kelly got him to assist them with his knowledge on the subject in formulating a plan of organization that would meet "all the necessities of the undertaking." He assisted and indicated the method by which they could secure the requisite franchise. On the 10th of June, 1886, an agreement was reached between Kelly, Flynn and McMahon. It was witnessed by Mr. Ecclesine, the lawyer, and provided that capital stock of a company to use the Dorsett system to the extent of $250,000 par value should be delivered to the plaintiff within one year.

The bill further declares that Flynn and Kelly, to procure the franchise, and all the time acting under the advice and with the assistance of the complainant, caused the Consolidated or Construction Company to appear before the Subway Commission through its attorney, Edward Lauterbach, "who had for a long time been, and is now, the private counsel and legal adviser of the defendant Flynn, as the complainant is informed and believes." It is alleged that Flynn and Kelly used the Construction Company to obtain the franchise, and caused the company to enter into a contract with the Dorsett Company to use its patent rights, and to pay in consideration thereof a certain amount of stock. Flynn and Kelly informed him that this had been done, and on Sept. 15, 1886, he struck for the delivery of one hundredth of the capital stock, valued at $150,000 and rapidly increasing in value. The Dorsett Company is declared to be owned by W. H. Kelly and the Construction Company by Flynn, or by them both jointly. It is also declared upon information that there has been no actual delivery of any of the stock as yet, or if a part has been delivered, it is held in trust for the defendants. As the complainant is informed that the stock is about to be disposed of, he applies for the block agreed upon, and asks an injunction so that any and all of de fendants may be restrained from transferring or hypothecating the stocks. George B. Newell, who is not generally known in legal circles, appears as McMahon's solicitor.

It is needless to say that strong denials of the charges are made by those interested.

The Ries Electric Railway Conduit System.

For some time past Mr. Elias E. Ries, of Baltimore, Md., has been devoting considerable attention to the subject of electric railway traffic within cities. He has elaborated a very comprehensive system, the full details of which, though highly interesting, we are unfortunately unable to bring before our readers at present, on account of the backward state of most of the patents applied for. One of the patents having just been issued, however, we are able to describe the method devised by Mr. Ries for preventing short circuiting of the line. Starting out with the proposition that for city traffic the conduit system is the only feasible one, Mr. Ries has taken into consideration the fact that provision must be made to prevent loss of current by the grounding or short circuiting of the line in the conduit due to the accumulation of water, whether on account of rain or of defective drainage, which is a special liability in low-lying districts.

The manner in which this is accomplished is shown in the accompanying illustration, Figs. 1 and 3 being respectively longitudinal and transverse section of the conduit. As shown in Fig. 1, a section of the conducting rail, between the points y and y', is severed at each end from the main portion of the conducting rail, and is bridged by an insulated wire loop f, the ends of which are connected with the conducting rail at opposite ends of the detached intermediate section. This bridge or loop is located inside of the conduit, and supported by pins, though, of course, the loop may be differently located, so long as it accomplishes the object of making metallic connections between the portions of the main conducting rail at opposite ends of the detached section. This detached section of the conducting rail traverses the low-lying district, in which water is liable to accumulate in the conduit and submerge the rail, and the object of its detachment is that it may be readily electrically disconnected or cut out from the main circuit when submerged, so as to obviate the dissipation of the current.

At one side of the conduit, at its lowest portion, there is a side chamber, shown in Fig. 3, which contains a water-tight box from one wall of which projects a metallic pin connected with the wire loop f by a conductor, a portion of which passes through the wall of the conduit, as shown by dotted lines. From the wall of the conduit a metallic pin projects within the water-tight box and has pivoted to it a switch arm m, which is normally pressed against the adjacent pin by a spring. The pin is connected with the detached section of the conducting rails by means of an insulated conductor, which is shown in dotted lines as embedded in the conduit wall and foundation of the conducting rail. In the wall of the water-tight box is a stuffing-box, through which plays a pin of non-conducting material, the inner end of which is arranged opposite the switch lever m, while its outer end receives the pressure of the upper end of a bent lever q; the latter has secured to its lower inclined arm a float r. The conduit is connected

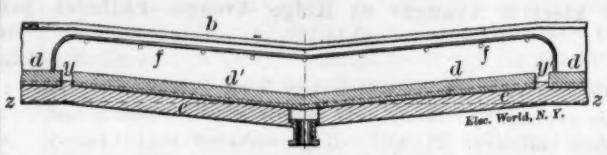


FIG. 1.—THE RIES ELECTRIC RAILWAY CONDUIT.

with the side chamber by an opening through the lower part of the conduit wall.

Normally the float r rests on the bottom wall of the side chamber, thus allowing the spring to force the switch lever m in contact with the metallic pin.

By referring to Fig. 2, which shows the connections diagrammatically, it will be seen that under normal conditions the detached rail-section d' is in regular metallic connection with the main portion of the conducting rail, the return circuit in this case being supposed to be formed by the surface rails. Now, if the low-lying rail-section d' should become submerged by water accumulating in the conduit, loss of current and perhaps a complete short circuit would take place ordinarily. But with the appliance above described, the water no sooner reaches the level of the float r, than it raises and causes the lever to put the arms m out of contact with the adjacent pin. This, of course, breaks connection between the rail-sections d' and the main portion of the conducting rail, so that the current, instead of being diverted to the earth, will travel

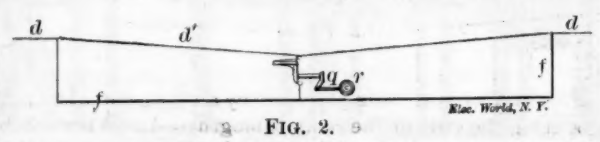


FIG. 2.

from one portion of the main conducting rail to the other by way of the loop f.

When a low detached section of the conducting rail is thus submerged, the cars upon the corresponding portion of the track must evidently be propelled by some other means than a current taken from the conducting rail, as the current-carrying portion of the rail is then not in contact with the wipers or brushes of the cars. The cars may be propelled over such portions of the road by horses or other temporary means, and Mr. Ries prefers the use of storage batteries on the cars for this purpose.

An analogous method to the one described above is also employed at street crossings, by which current is withdrawn from the rails, except at the moment of the passage of a car. In this way all danger from shocks to foot passengers or horses is avoided.

Why Changes were Made in the Western Union Directorate.

Dr. Norvin Green, President of the Western Union Telegraph Company, explained last week why Mr. Frank

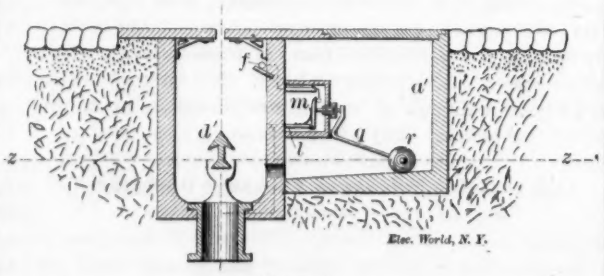


FIG. 3.

Work was no longer a member of the board of direction. When 700 shares of the American Cable Company were found to have been transferred from the name of Henry Day upon forged assignments, the question arose who should stand the loss. It was seen that the courts must decide the question. Work, Strong & Co. held a 100-share certificate of the stock in question, and they sent their counsel to demand a transfer of that certificate and to notify the company that unless the transfer was made the stock would be thrown out of the Stock Exchange. The demand was refused and the stock was thrown out.

The point made by the company against Mr. Work is that he urged the Stock Exchange to forestall the action of the courts, and that he was unwilling, as a trustee of the property of the company, to accept the advice of its counsel and await the decision of the courts. Suits have been brought by Henry Day and by several of the holders of the certificates, and decisions have been reached in the first courts. The courts have held, first, that the assignment of the certificate from Mr. Day was forged and fraudulent, and that the company was bound to reinstate Mr. Day in the holding of his certificates; second, that the parties presenting these certificates for transfer must be held to have guaranteed the genuineness of the assignment, and that so many of the certificates issued upon such forged assignment as had not been again reassigned and reissued, but were found in first hands, must be treated as invalid, and the company should not recognize them; third, as to such certificates as had been reissued a second or a third time, they were val'd against the company, and must be recognized; fourth, as to such certificates as had been reassigned and the company had to recognize, the company had its recourse for all damage sustained thereby against the parties presenting the forged assignment of Henry Day and obtaining the first transfer and reissue thereon.

Work, Strong & Co. held in their own name 100 shares which came under the second case, and they held for a customer 100 shares of the third case. Dr. Green says that Mr. Work should not be incensed at Mr. Gould, as he was thousands of miles away on the day of the directory election.

Military Telegraphs.

Colonel Macdonald, Commandant of the Queen's Edinburgh Rifle Brigade, has devised a very useful and compact equipment for the purpose of a regimental field telegraph, as distinguished from the divisional field telegraph. Colonel Macdonald expresses his views upon this point in the following words: "It is highly desirable that every regiment should carry its own telegraph appliances, so that it may establish telegraphic communication with its own outposts when acting alone, and that when acting with others telegraphic communication may be more rapidly established by each regiment laying its own cable on reaching camping ground, instead of the whole telegraphic plant for a division being carried in separate wagons and worked by a separate department. This field telegraph is designed to enable the necessary plant for telegraphing to be carried regimentally.

"It consists of:—1. One mile of double conductor insulated cable. The main wire is in the centre, and covered with insulating material. The 'return' consists of five small wires wound round the covering of the inner wire, and this is again covered. The 'return' thus makes the obtaining of an 'earth' unnecessary, and also acts as a protection to the main wire. The cable is wound in two lengths on two bobbins. 2. Telephone transmitters and receivers for ordinary speech, or where articulate sounds cannot be heard a special arrangement by which the Morse alphabet can be read by telephone. 3. A special coupling for rapidity, and which avoids the use of all screws, which might get lost, or sockets, which might get clogged, in the rough usage of a field telegraph. 4. Poles to carry the cables across roads where traffic might injure it. The guying arrangements of these poles make them adaptable to any position, and enable the erecting, taking down and re-packing to be effected with great speed. 5. Two bicycles to carry the plant. The poles are carried over the handles of the bicycles, and each bicycle has a half-mile bobbin supported on its backbone. The bicycles are trundled by the telegraph troop, the draught being extremely light. If surprised, the poles, which are of comparatively trifling value, can at once be thrown off and the bicycles mounted for escape." The apparatus, says the London *Electrician*, is shown at the Edinburgh Exhibition, and has been awarded a silver medal.

New Method for Determining the Time of Oscillation of a Magnet.

In a recent number of the *Annalen der Physik und Chemie* H. G. Hausemann describes a new arrangement for determining the periodic time of a suspended magnet. This method, which can be adopted for any similar purpose, consists of an ingenious application of photography for recording the differences of agreement in position between the magnet under observation and a seconds pendulum. The magnet is provided with a mirror in the ordinary way, by reflection from which the divisions of a scale mounted before it can be read off in a telescope. A small mirror fixed to the pendulum and parallel with its plane of oscillation, reflects when at rest the beam of an electric light on to a prism, provided with a broad slit crossed by a narrow vertical bar; from the prism the light is reflected on the mirror of the magnet, from which, when near its neutral position, the barred slit is focused in a small photographic camera specially constructed for the purpose. The slide of the latter is furnished with a micrometer screw, so that the plate can be moved through a known distance between any two exposures. The elongations can be read on the telescope in the usual way, and by measurement of the distance between the images on the negative, the number of oscillations of the magnet corresponding to a given number of those of the pendulum can be accurately determined, if the times of exposure are chosen when the pendulum and magnet are both near their positions of rest. This method naturally admits of extreme accuracy in the determination of the quantities sought for, besides reducing the time required.

The New Field Sextuplex Telegraph.

The multiplexing of telegraph lines has been effected in several ways, among them being the methods of compensation and neutralization, as in the duplex and quadruplex; the method of synchronism, as in the Delaney and Callahan system; and also the method of harmonic telegraphy, such as that devised by Gray. We might also mention the increase of the capacity in lines effected by the methods of simultaneous telegraphy and telephony over the same wire.

In the new sextuplex telegraph system of Mr. Stephen D. Field, which is described below, while some methods are employed analogous in some cases to those used in the systems above mentioned, the system as a whole is decidedly novel and interesting, and, judged from the results of its practical operation which we recently had occasion to witness, is destined to an early application.

Mr. Field has started out with the well-known fact that currents of different "quality," if the expression may be allowed, if sent simultaneously over the same wire, do not interfere with each other, and can be caused to operate corresponding receiving instruments at the other end of the line. Thus, in the new system three different qualities of current are employed, viz., a direct current of increasing and decreasing strength, operating a neutral relay; a reverse current, operating a polarized relay; and a rapid vibratory current, which sets a telephonic diaphragm in rapid vibration. These three currents acting upon corresponding receiving instruments, do not interfere with each other, as will be shown below; and as each one type of working is duplexed by the well-known compensating method, the line is evidently capable of transmitting three messages in either direction, or six simultaneously.

The arrangement of circuits and apparatus by which these results are effected is shown in the accompanying diagram, Fig. 1. We may remark at the outset that not a single cell of battery is employed for any purpose, both the main line and locals deriving current from a dynamo. The latter is shown at *F*, and the armature, as will be seen, is provided with two independent sets of windings, which deliver current respectively to the commutators *E* and *D*. The local currents are taken off the commutator *E*, the circuit connecting with the three local transmitters, 1, 2 and 3, which are manipulated in the ordinary way by the keys K^1, K^2, K^3. The main current is taken from the armature from the commutator *D*, this current serving to actuate the neutral and polarized relays which are shown diagrammatically at 2′ and 1′ respectively. It will be noticed that the dynamo *F* is shunt-wound. Its armature is of 150 ohms resistance, and it has an E.M.F. of 300 volts at 500 revolutions. The shunt coil is divided so as to give a long and a short shunt at the points *G*, *H*, depending upon whether the transmitter 2 be closed or open. The resistance of the short shunt is 540 ohms, and that of the long shunt is 6,000 ohms. Hence it follows that by pressing K^2, the armature of transmitter 2 is attracted to the front stop and short-circuits the long shunt of the dynamo. This, of course, causes an increase of current in the short shunt, the strength of the field magnets remaining constant; and hence there ensues a decreased effect in the line current, and it is upon this increase and decrease of the direct current that the neutral relay 2′ operates. We will not for the present enter into a description of this relay.

Transmitter 1 operates a pole changer by which reverse or alternate currents are sent over the line which actuate the polarized relay shown diagramatically at 1′. The pole-changer is so adjusted as to be continuity-preserving as regards the line, but with a very slight break toward the dynamo.

It is evident that the continuous current designed to operate the neutral relay has no effect upon the polarized relay; but the reverse currents designed for the latter would affect the neutral relay if some provision were not made to prevent this disturbance. This has been recognized by Mr. Field, and he overcomes the difficulty in a very simple manner.

The neutral relay 2 is shown in part perspective in Fig. 2. To understand its operation, we will premise that when ordinary reverse currents are sent through a neutral relay the armature is kept in a state of vibration, breaking contact momentarily at each reversal, but being immediately re-attracted. With the arrangement of the neutral relay shown in Fig. 2, the reverse current has no effect on the armature. This result is obtained by taking advantage of the induced currents generated by the reversals. As will be seen, the core of the relay is lengthened, and has a bobbin *B*, surrounding it. The latter is connected to another small bobbin *C*, surrounding a core *H*, which is placed opposite a small cylinder of iron *K*, acting as an armature and attached to the lever of the relay. The reversal of current in the relay bobbin causes a change of polarity in the core, and the tendency is to momentarily throw off the armature; but at the same instant of the reversal of polarity an induced current is set up in the bobbin *B*, which is in opposite direction to the primary, and which, in circulating through *C*, tends always to magnetize the core *H* oppositely to that of the main core, and hence, with a corresponding influence upon the small armature *K*. The result of this is, evidently, that with two opposite influences acting upon the lever, it will remain stationary and insensible to the effects of the reverse currents.

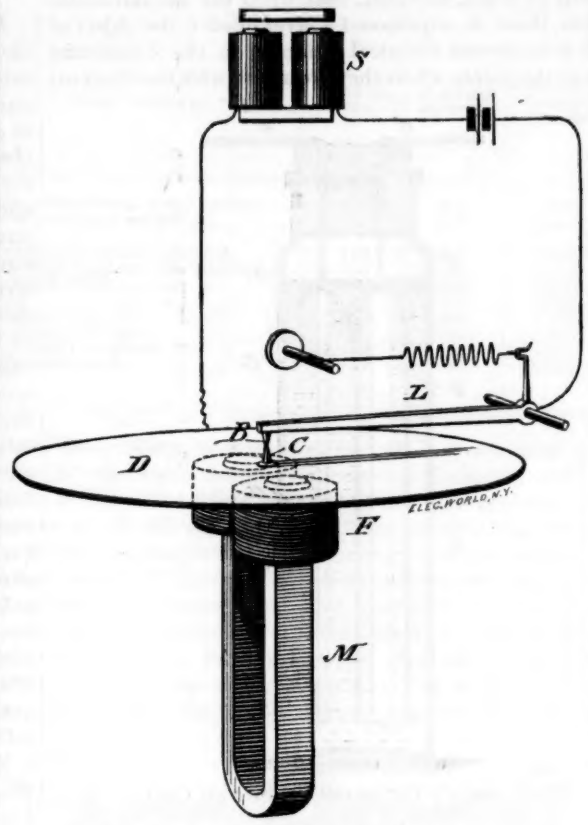


FIG. 3.—THE VIBRATORY RECEIVER.

We come now to the third and last method employed in transmission, which consists in sending a rapidly vibrating current over the line which is made to set a telephonic diaphragm in vibration.

The source of the vibratory current is the small dynamo shown at *A*. From the arrangement of circuits, it will be seen that the commutator *B* cuts the line coils of the vibratory-magneto, that is, the outer ring of magnets, out of circuit, except at the instant of passage of the poles, and thus reduces the resistance of the circuit from 160 to 5 ohms, which changes evidently occur in continuous rapid succession, sending a vibratory current over the line. These currents charge the condenser C^3, at the distant station, which tends to increase their abruptness, and thence pass into the vibratory receiver or relay 3′. The latter is shown in detail in Fig. 3. It consists of a horseshoe magnet *M*, upon which are mounted the coils *F*, through which the vibratory currents from the line are made to pass. Opposite the poles of the magnet is placed the diaphragm *D*, which has a platinum pin *C* mounted on its centre. Resting upon this pin is another, *B*, which is attached to the end of a lever which, together with the diaphragm *D*, is in circuit with a sounder *S*. A local battery is here shown in circuit merely for the sake of clearness, the current being in reality taken from the local leads of the dynamo.

Now, when the key K^3 is open, the armature of the transmitter 3 is on its back stop. and closes a circuit including a 40-ohm resistance, so that the current from the vibratory generator is short-circuited and does not go out over the line. When the key K^3 is depressed, however, the armature of 3 is attracted, breaks the short-circuit, and the vibratory currents then pass out to the line. Arriving at the receiver, shown in Fig. 3, they set the diaphragm *D* in rapid vibration so that the pins *B* and *C* are given a rapid make-and-break motion; in fact, so rapid is the motion and so short a time are the pins in contact, that the local circuit is practically open and the sounder has not time to act, being purposely made sluggish in its movements; the local circuit remains open, then as long as the key K^3 is depressed. The dots and dashes of the key are therefore received on the vibratory receiver as a series of "buzzes," which are transformed in the manner described into dots and dashes on the local sounder *S*.

Both the relays as well as the vibratory receiver are wound differentially, as in the ordinary duplex service. The action is very smooth, and ordinary changes of condition on the line do not affect the working. The static capacity of the line at the time of our examination of the apparatus, when increased from that of a few miles to that of a line over 400 miles in length, required only a slight readjustment of the vibratory receiver.

Telegraphs in China.

The occasion of the acceptance of the principle of railways by the Chinese authorities, and finally overcoming the stubborn and dogged obstinacy against change, which is one of the leading features of the Chinese character, was the Franco-Chinese war. Had the hostilities continued for another six months, there is no doubt that at the present time several lines of railroads would have been in full operation in China. Telegraphy, which was in its infancy in China during 1884, when active hostilities commenced, received a great impulse, and telegraph lines are now extending to all parts of the country. The material is all bought in Denmark or England, but the work of construction has been for some time almost entirely carried out by the Chinese themselves, who have been instructed by the Danish engineers and operators engaged by the authorities. This shows the tendency of the Chinese. It is the opinion of all conversant with the subject that the same course will be pursued in relation to railways when their construction is carried out on a large scale; Chinese will be educated by the European or American engineers, who will be engaged for the first work, after which the Chinese themselves will be the constructors.

The telegraph, it seems, has already destroyed much of the power of the provincial authorities, as the central government can now give its orders directly in a few moments, instead of taking weeks or months, as was the case formerly.

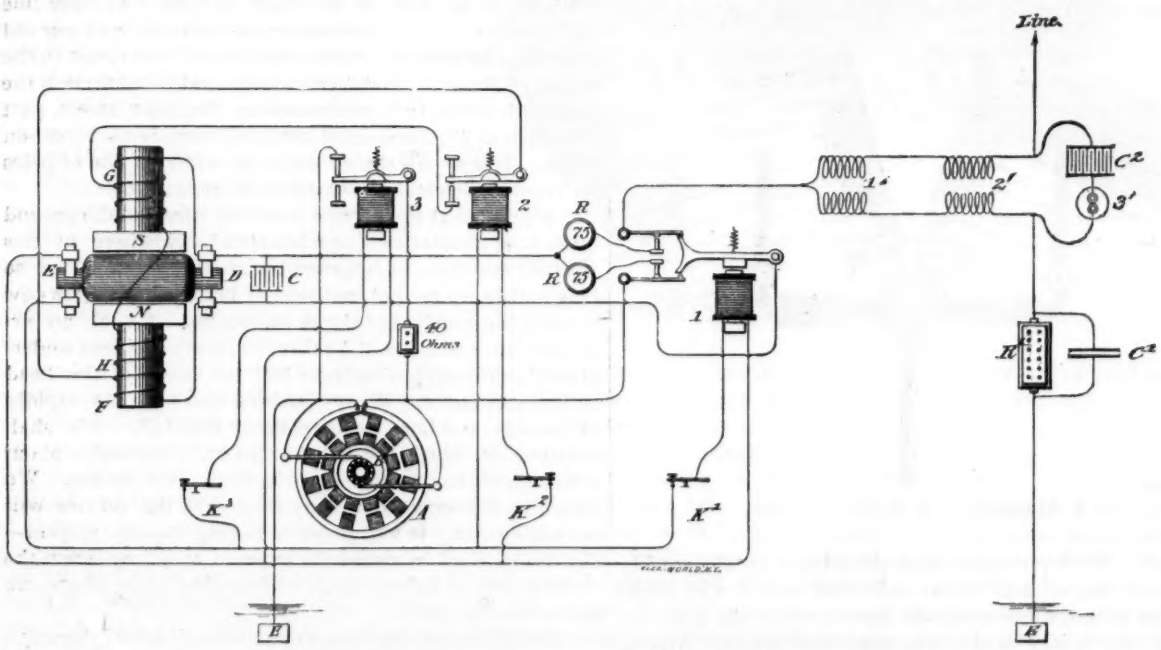


FIG. 1. THE NEW FIELD SEXTUPLEX—DIAGRAM OF CIRCUITS.

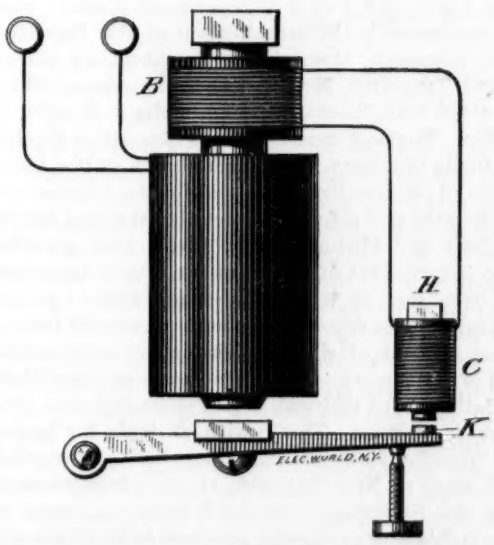


FIG. 2. THE NEUTRAL RELAY.

Gas Companies in the Electric Light Field.

We made some comments last week on an interesting article in the New York *Tribune*, with regard to the degree in which gas still occupies the field of artificial illumination and the manner in which electricity has made its way. A more recent article, on the same subject, has the following:

Those who have heretofore entertained any doubts regarding the ultimate success of electric lighting as a solid business industry, and the important position which its advocates have always claimed it would yet command in the commercial sense, have at last become convinced that their skepticism upon this subject has been ill-founded.

The enormous increase in the use of the arc light during the last year is exciting considerable attention in commercial circles. A somewhat significant and startling feature in the business is the fact that the more advanced and progressive gas managers are waking up to the importance of the great strides now being made in the electric arc light field, and are now generally accepting the theories which have for the last four or five years been so strenuously advocated by Mr. Edwards H. Goff, the founder of the American System of electric lighting, viz.: that the genuine interests of the gas and electric light companies were identical; that they should work together as allies, instead of opposing each other as common enemies.

One of the strong points which Mr. Goff has always made in his arguments is that increased use of the electric light would invariably cause increased consumption of gas, particularly where the electric light was used for street illumination. Mr. Goff's ideas upon this did not at first meet with any favor whatever with the gas or electric light companies, outside of his own, and were generally opposed and scouted, whenever discussed, until during the last few months. It seems that a complete revolution has taken place in the minds of the gas people, and now many of the gas companies are adopting the electric light themselves for street lighting, and nearly all of the companies are seriously considering the matter.

From a recent circular issued by the American Electric Manufacturing Company, of which Mr. Goff is president, it is discovered that two wealthy gas companies have not only adopted the American electric light to operate in connection with their gas plants, but have actually become general agents for the American company in selling its apparatus. The companies alluded to are the St. Paul Gas Company, of St. Paul, Minn., and the Citizens' Gas Company, of Jacksonville, Florida. Mr. Goff certainly ought to feel that although his advanced ideas upon this subject did not for a long time meet with any favor, the general adoption of them now by the gas companies as sound and business-like is ample compensation for his fidelity to the subject, especially as it is altogether likely that the gas interests of the country will naturally look to the originator of this plan of business as their material and loyal ally.

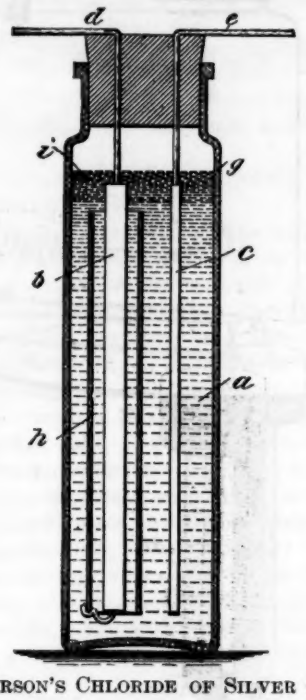
Several other gas companies in different parts of the country are already adopting the American system of electric lighting. Among the more important recent contracts of this kind is that made a few days ago with the Suburban Light and Power Company, of Boston, composed of gentlemen in the management of the Brookline Gas Light Company, through the President, Dr. Robert Amory, and Treasurer, Mr. Francis W. Lawrence, which has contracted with Messrs. Sowdon, Elder & Wright, of Boston, New England agents of the American Electric Manufacturing Company, for an installation of the American system of electric lightning, and for the construction of complete wire and pole lines extending through Brookline, Brighton and Allston. The contract thus awarded is a strong indorsement of the American system, inasmuch as the decision was, as we are informed, arrived at only after several months devoted to examinations and tests of the various systems of electric lighting, by a committee composed of Dr. Amory and Messrs. Lawrence and Holtzer; the latter of the eminent and well-known firm of S. W. Fuller & Holtzer. This is without doubt the largest single contract for electrical apparatus and construction work ever made in New England, as the plant contemplated by the Suburban company is on a very extensive scale, the rights of way already obtained in Brighton and Allston permitting the erection of 700 poles, and the complete circuits will require some 75 miles of copper wire. This change of front on the part of the gas companies is very significant, and it certainly places the electric light in a commercial position equal to that of the gas companies.

A New Arrangement of the Chloride of Silver Battery.

In chloride of silver batteries as usually constructed the chloride of silver element is covered with parchment paper to prevent its coming in contact with the zinc. Sometimes, also, a block of rubber is placed between the elements for the same purpose, the elements being bound together by rubber bands. When cloth or parchment is used, in order to examine the chloride of silver element, it is necessary to remove it from the battery and unwind the wrapping. In the use of a block of rubber, it is found that particles of silver or zinc become detached and fall upon the block of rubber, thus forming electrical connection between the two elements. It was in order to avoid these difficulties that Mr. Wm. R. Patterson, of Chicago, Ill., has devised the arrangement shown in the accompanying illustration. The difficulties mentioned are overcome by the use of a transparent tube which completely surrounds the chloride of silver element. This tube being open at both ends, allows the liquids to circulate freely, and prevents connection between the silver and zinc elements.

Referring to the illustration, it will be seen that the chloride of silver element *b* and the zinc element are suspended in the sal-ammoniac solution by their connecting wires *d* and *e*, which pass through the cork inserted in the jar *g*. The connecting wire *d* is of silver, and is bent at its lower end to form a support for the glass tube *h*.

It will be noted, however, that upon the sal-ammoniac solution there is superposed a layer of oil *i*, the object of which is to prevent chemical action upon the connecting wires at the points where they are united with the elements

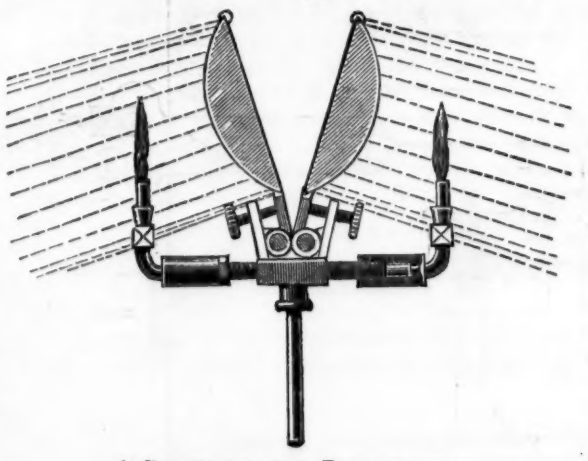


PATTERSON'S CHLORIDE OF SILVER CELL.

of the battery. The oil *i* is sufficient to cover the joint between the zinc element and its connecting wire *e*, which, on account of the protection of the non-conducting oil, may be of copper instead of silver, as heretofore required, and may be connected with the zinc by solder, without injurious consequences.

A Hint for Electric Lighting.

Writing to the *Engineer*, Mr. John G. Winton says: "Not until each street is turned into a miniature lighthouse, distributing the rays of light from the gas by reflection or refraction, can we say that gas has been fully



A SUBSTITUTE FOR REFLECTORS..

utilized. We have many lamps burning a great quantity of gas, giving off a powerful light, and reflected in bright patches immediately under the lamps, while the space between the lamps is in comparative darkness. Among many plans we have devised for the all-round system of lighting by reflection or refraction, we consider, for narrow streets, throwing the beams of light right and left along the pavement to be preferred, allowing the gas of itself to light across the street, and which is aided by the spreading of the rays from the double lenses, as per engraving, and which we have practically tested in one of the lamps at the municipal buildings here, which we have been kindly granted the free use of by the authorities. There are two convex lenses placed closely together at the bottom, with the convex surfaces inclined downward, and which can be set at any angle that may be determined on with the small set screws as shown; likewise, the jets can be adjusted as shown, but this may be entirely dispensed with on ordinary occasions, the lenses and jets being quite rigid and immovable. The gas jets are placed in front of the lenses and are always visible. The rays from the one are refracted through the convex surface, and, being caught up by the other lens, are refracted downward on the pavement at any angle that may be desired. It will thus be seen that the rays from the one light are refracted through the other light, and *vice versa*. With this plan there are no shadows as with reflectors. A stream of soft light is thrown right and left along the pavement, and partially distributed across the street, and is by no means hurtful to the eye, while the gas of itself lights up the foot of the lamp and across the street. The gas remaining always visible is the main feature in this arrangement. We may mention that the lenses are 4 inches in diameter, but would recommend 6-inch lenses as preferable." Here is a point worthy of consideration for electricians in this country.

Underground Work in Boston.

At the present time, the large cities are all getting some idea of practical underground work, and the results obtained are carefully watched by electricians and others, for purposes of comparison. A little while ago, we were able to give some details of the work being done in Boston. An observant New York electrician who lately passed through the city, writes us: "One thing strikes me in this town and that is the total absence of pole lines in the principal streets. In Washington, Tremont, and several other like streets, no poles are to be seen. There are but comparatively few street lights, however, and they are fed from the house-top, wires in many cases running along the sides of buildings. Quite some underground work is going on. The Edison people are putting down mains, and I saw some Callender cables and wires going into trenches in Tremont street. It seems to me that the question resolves itself into this: doing away with the poles and wires does away with a number of lights. It might be asked: Can New York get along without poles on Broadway or in such thoroughfares? Well, Boston does, and I must say that in trim appearance Boston streets are far ahead of those in New York. Of course, there are lots of pole lines in Boston for various purposes, as every one knows, but they are in such streets as furnish no particular objection on the score of preservation of beauty. If something similar had been tried in New York, I do not think there would have been so much 'underground' talk or so much compulsory legislation."

With regard to the underground work being done by the New England Telephone Company, one of the officials says:

"We have just completed a work of that kind on Berkeley street from Providence street to Beacon street. We have laid a conduit there that will take 600 wires, and have already put into that conduit 200 wires. This action will enable us to take down the wires and poles in Copley square, which cannot be called ornamental. We were not compelled to take this action, but did so in deference to the common opinion that to do so would improve the appearance of that part of the city. It will also enable us better to reach our Back Bay subscribers, who are multiplying rapidly. Telephones are being placed in residences there, but we have not heretofore been able to reach them as well as we shall now be. Another line which we are placing underground connects with our old underground system, which leads from Pearl street to the corner of Franklin and Arch streets, and runs through the intervening streets to and including Tremont street, past our office at 450 Tremont street, and extends to Pynchon street. This avoids the necessity of setting a line of poles on Tremont street, as has been contemplated by us.

"We feel that the operation of the wires underground for so long a distance is problematical. Nowhere in this country are there underground wires in operation for so long a distance as that, and we are laying these wires now to solve the question of the practicability of such an arrangement. There will be three miles of continous underground wires extending from 50 Pearl street to the head of Tremont street. We are pushing this work as rapidly as possible, and hope to complete it this fall. We shall continue it until the frost stops us. Probably about $40,000 will be expended in this work this season. We hope that the experiment may show that the service will not be injured. It will prove a saving in one respect—that is, we shall be spared the expense of taking down the cable in case of a fire, which we have had to do where we had overhead wires.

"The officials of this company have made a very thorough examination of the various systems suggested, and spent some time in examining those in effect in New York, Philadelphia, Washington, Pittsburgh, Brooklyn and other cities. As the result of that examination, we adopted, in the work done this fall, a conduit of creosoted wood. It is the same method that is being used in Brooklyn. The wood has to be creosoted in Brooklyn, as it is not done anywhere else. Twelve pounds of creosote oil is forced into each cubic foot of pine lumber. The line of conduits running under Tremont street has capacity for 1200 wires. The depth which the wires are buried varies on account of the obstacles we meet in the shape of water and gas pipes; but the average depth is about four feet. We are projecting other work, which, when completed, will do away with all of our masses of wires, leaving as the only wires strung in the air the short wires which it will still be necessary to run from the cable into the subscriber's house as a connection. There is no other way to do that. We had put 400 miles of wire underground before we commenced this work this fall, and we will have 1,500 miles before the commencement of next year. We have had the wires un-

derground for such short distances as from 50 Pearl street to State street, and from 50 Pearl street to Washington street via Franklin street. They work well, although the current is a little sluggish, and not quite so good as an open air current. Still, with the very best cables, it may work well. There is no precedent which will give us the assurance that our wires will work well underground a distance of three miles. Of course underground wires never get crossed, as surface wires do. There is something to be said on both sides of the question."

The Raffard-Breguet Dynamo.

It will hardly be disputed, says *Industries*, that at the present moment the most perfect incandescent light dynamos are produced in England. As regards arc lighters, we are in fairness bound to admit the superiority of American designs; but for incandescent lighting and for motive power purposes, we claim the lead. There are in this country about a dozen first class firms whose machines are so good that it would be difficult to say which of them turns out the best work. They all work on sound scientific principles, and couple with it the practice of high class mechanical engineering. A French electrician who has recently paid a visit to London, and was afforded every facility to inspect the works of several reputed makers of dynamos, told us how astounded he was to find the manufacture of dynamos reduced to an exact science. We design, calculate, make, and test dynamos as we do with any other piece of machinery, whereas, according to our French visitor, nothing but rule of thumb is used even in the best dynamo shops in France. We do not wish to say anything about the merits or otherwise of the work turned out by our French competitors in this particular industry, and as it has not been our good fortune to be admitted into their dynamo shops, we can neither confirm nor refute the statement of our informant. We simply give it as it was made to us. We are, however, able to place before our readers some data referring to the modern practice in one of the best French dynamo works. For these data we are indebted to the courtesy of M. Raffard, the designer of the machine under notice.

As will be seen by the accompanying illustration, the dynamo is of the old "Gramme" type, but contains several modifications, most of which are distinct improvements. In the first place, the armature core is not a coiled ring of iron wire, but consists of thin iron washers, about 12 to the inch, which are insulated from each other by paper discs. The paper is thickly varnished, and the varnish serves to hold the core together until, by the usual longitudinal taping and further applications of glue or varnish, the whole forms an almost solid ring. The core is 5 in. long, 4¼ in. internal and 7½ in. external diameter. It is wound in the usual Gramme fashion, with 23 lb. of 87 mils double cotton-covered copper wire, and the coils are connected to a 60-part commutator. The complete armature measures 8½ in. in diameter. On the spindle is fixed a twelve-sided prismatic castiron hub, and twelve hardwood wedges are driven between this hub and the inner circumference of the armature, by which the latter is centred and held in position on the spindle. Six of the wedges are driven from one side and six from the opposite side. The brushes are fixed on a rocking bar. The spindle is left protruding on either side of the frame, so as to admit the pulley being placed where convenient.

The most remarkable part of the machine is the frame. It consists of two pieces only, bolted together by horizontal flanges, as shown in our illustration. Magnet cores, pole piece, and half the yoke on each side are cast in one piece. The flanges are planed, bolted together, and the holes for the bearing bushes—which are solid—and the polar cavity are bored out at one setting from the same bar. This insures the armature running absolutely true between the pole pieces, which embrace about two-thirds of the circumference. It will be remembered that in the old Gramme machines the magnet cores were cylindrical wrought iron bars connecting the yokes and pole pieces. M. Raffard finds that, although he uses cast iron cores for the sake of cheapness, he loses nothing by the change, the magnetic inferiority of cast iron being counterbalanced by an excess of cross sectional area. The section of his magnets is oval, 2 in. by 6¾ in., and they are wound with 78 lbs. of 160 mils wire. The over all dimensions of this machine are: Height, 22 in.; breadth, 14 in.; length, inclusive of protruding spindle, 33 in. The cast iron frame weighs 3¾ cwt., the armature 65 lbs., and the whole machine a little over 5 cwt.

At a speed of 1,400 revolutions per minute, the electromotive force is 110 volts, and the maximum current 35 ampères. The machine is series wound, and has an internal resistance of .8 ohms when cold. M. Raffard informs us that over a hundred of these machines have been manufactured by the Maison Breguet, and as yet not a single one has come home for repairs.

Construction of French Dynamos.*

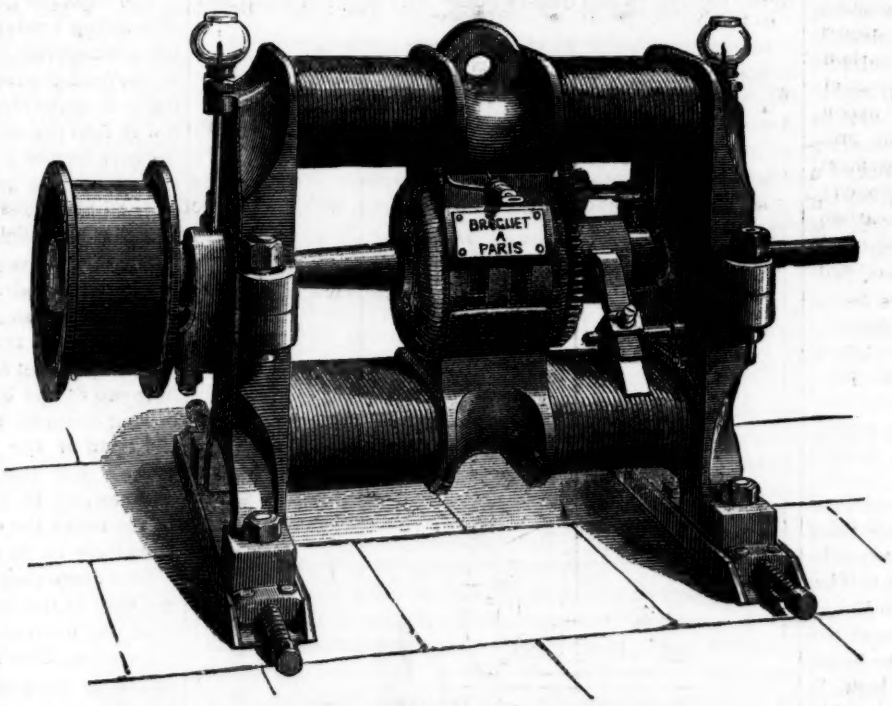
BY R. E. CROMPTON.

Many English electrical engineers have read with astonishment the descriptions which have from time to time reached this country of the dynamo machines specially designed by Marcel Deprez for his experiments in transmission of power from Creil to Paris. The details of construction of these machines, so far as they have been furnished to the public, have led us English makers to believe one of two things—either that Marcel Deprez considered the problem he was working out of transmitting power by electrical energy to extreme distances, and which rendered the use of very high E. M. F. a necessity, was one which differed so widely from existing requirements, that he was justified in deviating from the engineering practice of the day; or, on the other hand, that at the present time there is no such standard practice in France at all answering to standard practice in England and America. The Raffard-Breguet dynamo, recently described, inclines us to the belief that the latter is the true explanation. The Maison Breguet has from the very first occupied a leading position among manufacturers of dynamo machines in France. It is, therefore, reasonable to suppose that a type of machine selected by them for illustration would include some of the points of modern practice in dynamo construction. We are informed that over one hundred of this particular type of machine have been manufactured; this must mean that the type is considered a satisfactory one by both the manufacturers and their customers. Very little of the data usually furnished by modern English and American manufacturers of dynamos are given in the article quoted, and this makes it difficult for us to fairly compare it with the machines of contemporary English makers. We, however, from the dimensions, data, and engraving actually furnished, are able to form a pretty correct notion of some of the points omitted. Let us take the machine in detail. The most important part, the armature, is nothing but the old Gramme armature, with its old defects. The core is of small radial depth, and therefore containing far less iron than is usual in modern machines; the outer periphery of the core is so far distant from the polar surface that the interpolar air space is very great, thus making the magnetic circuit of high resistance, and the field correspondingly weak. To make up for this weak field, the desired E. M. F. is obtained by an increased number of turns of armature winding; although the number of these is not stated, we can calculate them from the weight and gauge of the wire, and the statement that the commutator has sixty parts; we thus find that there are 840 turns. The maximum current is given at 35 ampères; therefore this armature, when fully worked, must have a field of its own corresponding to 14,700 ampère turns. Now, in such an armature, worked in such a weak field as that inevitable to the use of cast iron, and to the large interpolar air space, it is certain that the disturbing influence of the armature field, and the self-induction of its winding will be severely felt, in the form of great and varying angle of lead of the brushes, which will cause heavy sparking and wear of the commutator, if the machine be used as a shunt or compound wound dynamo. In fact, it is probable that it is only when series wound, as described, that it will work satisfactorily. It is evident, therefore, that the Maison Breguet either are ignorant of all that has been done outside France in improving the electrical design of armatures, so as to remove the above mentioned salient defects; or if they do know of them, they have wilfully disregarded them. Turning to points of purely mechanical construction, the armature is, as in the old form of Gramme, held in its place on the spindle by friction only; the sole alteration being that in place of the old wooden hub, forced into the wound ring and held therein by friction, there is a twelve-sided prismatic cast iron hub centred and holding the ring by twelve hardwood wedges, driven in between the cast iron and the inner surface of the winding. This is not an improvement even in the mechanical point of view, as it will be a matter of difficulty to drive these wedges so as to accurately centre and balance the armature; further than this, there is an extreme liability to damage the insulation of the winding during the act of driving the wedges; but from an electrical point of view, the cast iron hub is the reverse of an improvement, as it must certainly tend to divert a number of lines across the interior of the ring. The effect of such internal field, as is well known, must be subtracted from the useful field. The illustration shows that the position and arrangement of the brush holders is exactly the same as it was in Gramme's machine, as designed in 1878, the brushes not being mounted on one bar, so that the angle cannot be varied. It is true in the description this is stated not to be the case, but on this point the letter press does not agree with the illustration. It will be interesting to compare a few of the electrical measurements of this machine with those of English makers exhibited in the Inventions Exhibition last year, and the accompanying table shows very clearly in how many points it is behind these machines. The machine is described as series wound to give 110 volts. It is, therefore, either intended for two arc lamps in series, or for incandescent lighting; but it cannot be designed specially for the latter use, as not being in any sense self-regulating; it can only be used for a fixed or nearly fixed number of lights. All slight alterations of speed would be greatly exaggerated in the light, and any installations using such a type of machine would be run under great difficulties. It is only when used for driving two large single arc lamps, arranged in series, that it would work well. In this case, the great self-induction of the armature would be an advantage, as an aid to steadying the current in the lamps; and probably in this we have a clew to the whole matter. The French dynamo makers, as exemplified by the Maison Breguet, are still continuing to manufacture small series wound Gramme dynamo machines, very slightly modified in points of detail from the old A Gramme, as it left the hands of M. Gramme himself, and was exhibited by him in the year 1875. This speaks in high terms of the excellence of M. Gramme's design at that date, but makes it rather appear as if French electrical engineers were content with the great triumph then obtained by M. Gramme, and that they have since shut their eyes to the vast improvements that have taken place outside France during the eight years that have elapsed.

Industries, Nov. 5, 1886.

TABLE SHOWING COMPARATIVE MODES OF CORE ATTACHMENTS. ELECTRICAL EFFICIENCY, AND INCHES OF ARMATURE CONDUCTOR PER VOLT OF NINE ENGLISH DYNAMOS, AND THE RAFFARD-BREGUET FRENCH DYNAMO.

NAME OF MAKER.	Working volts.	Working current.	Current density in armature	MODE OF ATTACHMENT OF CORE TO SPINDLE.	Reduced to uniform speed of 3,000 ft. per minute.	
					Electrical efficiency.	Length of armature conductor per volt.
Edison-Hopkinson (large machine)	110	300	2,570	Discs keyed to spindle	96 per cent.	18.2
Crompton (large machine)	110	217	2,650	Radial arms dovetailed to spindle and to core discs	96 per cent.	25.0
Elwell-Parker (large machine)	110	460	3,300	Metal arms	94 per cent.	30.0
Crompton (medium size machine)	110	100	2,650	Radial arms as above	90 per cent.	33.5
Mather & Platt	110	220	3,200	Radial arms	89 per cent.	34.8
Kapp	110	125	2,720	Radial arms	Not given.	35.0
Paterson & Cooper	110	380	2,100	Metal arms bolted to core	91 per cent.	41.0
Goolden & Trotter	60	200	2,950	Metal arms let into core	Not given.	41.0
Crompton (small size)	60	33	4,800	Metal arms dovetailed to core	78 per cent.	42.0
Raffard-Breguet	110	35	9,240	Core centred and driven on a cast-iron hub by wooden wedges	78 per cent.	113.0



THE RAFFARD-BREGUET DYNAMO.

An Aged Messenger.—A "messenger boy," 88 years old, delivers messages briskly for the W. U. office at Easton, Md. The Baltimore *Sun* says the old messenger often climbs several flights of stairs with alacrity (and dispatches) every day.

Electric Lights Compulsory in the New Aqueduct.

A great stir has been made recently with regard to the bad ventilation and lighting of the new aqueduct that will furnish New York City with an increased supply of water. There has unquestionably been great complaint, but it seems likely that the insistance on electric lighting will bring about a much better state of affairs. At a meeting of the Aqueduct Commission on Nov. 16, Commissioner Ridgway submitted the following resolutions:

Whereas, Notwithstanding the repeated promises of Contractors Brown, Howard & Co. and John Brunton & Co. to comply with the order given under direction of the Commission by its chief engineer to light the tunnels under their contracts with electricity and improve their method of ventilation;

Whereas, They have not complied with said order, but, on the contrary, in places where masonry is being put, it frequently appears that they allow the air-boxes to be displaced so that there is no provision for the introduction of pure air into the heading; and

Whereas, They still continue the use of gasoline lamps, vitiating the air to such an extent as to make it detrimental to health and life; therefore, be it

Resolved, That this Commission take immediate steps to enforce the order issued by the chief engineer to the contractors under date of June 22 and Sept. 9, directing them to place electric lights and power blowers upon their works.

Mr. Fish seconded the resolution, and after some discussion it was decided to postpone the matter for one week to await the opinion of the Corporation Counsel as to the best method to be adopted to compel the contractors to do as directed.

Fluorescence from Electric Discharge.

We recently mentioned that M. Lecoq de Boisbaudran is engaged in an investigation upon the fluorescence of different substances under the electric discharges in a vacuum. The following are some of the results which have been obtained: Sulphate of lime, after being heated to a dull red, gives a feeble fluorescence, with a continuous spectrum; but when MnO, SO_3 is added it furnishes a beautiful green tint. With $\frac{1}{100}$ part of this salt the effect is very fine, and with $\frac{1}{200}$ it is superb. The spectrum is continuous, but contains little red or violet. Carbonate of lime gives fluorescence *in vacuo* after strong calcination, and a violet tinge at the electrodes. With carbonate of lime, rendered manganiferous, there is an orange fluorescence after calcination; sulphate of magnesia, after being heated red a little, gives a feeble fluorescence of a greenish white, with continuous spectrum. Pure carbonate of magnesia gives no notable fluorescence after strong calcination. Similarly, carbonate of magnesia containing a little carbonate of manganese, furnishes fluorescence. Sulphate of zinc, after heating to dull red, gives a feeble fluorescence of a pale rose color. Sulphate of cadmium, oxalate of strontium, and some other salts, also yield a fluorescence in vacuum.

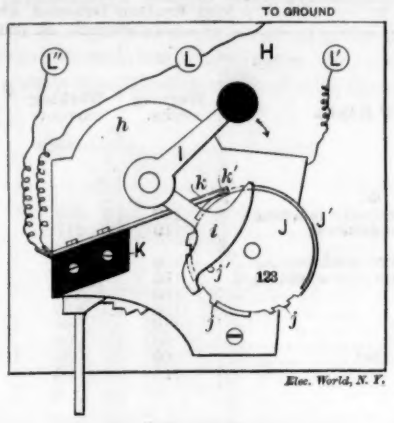
The McCulloh District Telegraph and Fire-Alarm System.

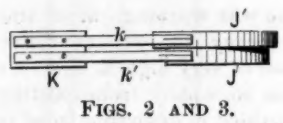
The steady increase in the number of cities providing themselves with district messenger and alarm service makes it of interest to note some recent improvements in this field, by means of which the efficiency of the service is brought to a high state of perfection. In the ordinary forms of these systems, the breakage of the line has either resulted in the cutting out of the stations beyond the break or in making the entire circuit inoperative until the break is located and repaired. It was with the object of remedying this defect that Mr. Chauncey F. McCulloh, of Baltimore, has invented the system described in detail below, in which the occurrence of a break is instantly signaled at the central station, where the arrangement is such that the entire circuit can immediately be made operative again, as if no break had occurred. Indeed, nothing short of two simultaneous breaks, one on each side of a station, can throw it out of communication with the central office, and even then the other stations of the same circuit are unaffected.

Broadly stated, the system consists in connecting the several stations with the main office by a wire, making a metallic circuit and providing each station, as well as the central office, with a ground connection. These ground connections are all nominally open, so that the occurrence of a break is instantly made known at the central office, where the ground being then thrown on, a circuit is set up as each box is operated. Provision is also made at the central office for detecting an accidental grounding of either part of the wire in case of a break, and for obviating it, so that both parts of the broken circuit are made operative in any event.

This arrangement requires that the box at each station be provided with a device for simultaneously making and breaking connection with the main line and with the ground, so that while the line is intact the current passes over the wire; but in the event of a break the return is through the ground.

The manner in which this is accomplished is fully shown in the accompanying illustrations, in which Fig. 1 shows the usual arrangement of the central station and the circuits *a a'*, *b b'*, *c c'*, having each a number of stations *A B C*. These stations are all connected by a main line wire with the central office, where they are attached as usual to disc-switches 25, 25′, 25″ of the usual type. 22 is the local battery; 10 the No. 1 main battery; 11 No. 3 main battery; and 12 the extra battery, to be used on any of the circuits of the switch-board. The extra battery 12 is connected by the wire 1, leading through the relay 18, with the right lower segment of each of the upper disc switches, the wire from the other pole of the battery leading through the relay 17, by the wire 2, to the corresponding segment of each of the lower discs. The No 1 (10) main battery is connected by wire 3 with its relay 24, from which the wire 3 continues to the left lower segment of the disc 25, which latter is normally in electric connection with the upper half of





FIGS. 2 AND 3.

the disc through a plug 26. From the upper half of the disc the current traverses the line *a a'*, returning to the upper half of the lower disc 25, which is connected with the left lower segment of the same by a plug 27, and thence by the wire 4 to the battery. Such is the normal arrangement of the circuit *a a'* with reference to the battery 10 and disc-switches 25, being the usual and

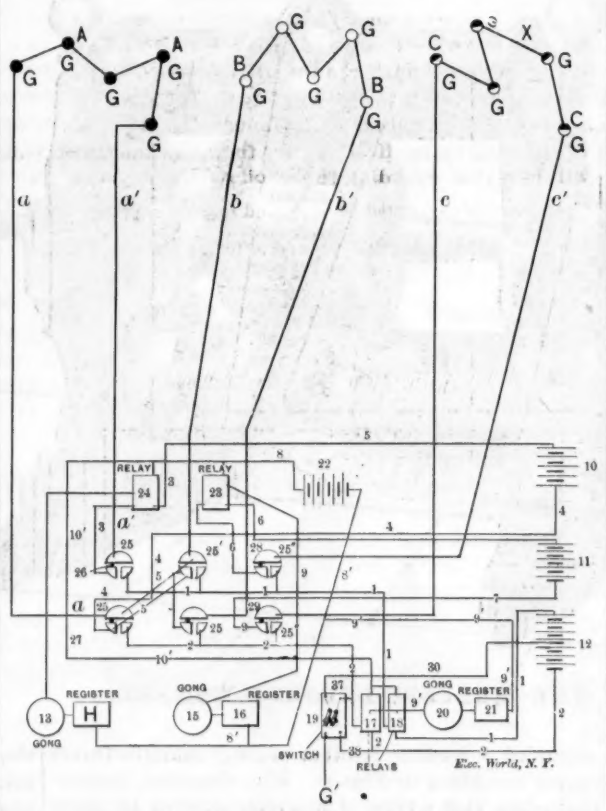


FIG. 1.—THE MCCULLOH DISTRICT MESSENGER SYSTEM.

well-known arrangement. Double cords 5 5, having split plugs on their ends, connect the first circuit *a a'* with the second *b b'*, as shown.

The third circuit *c c'* is connected from the upper half of the disc 25″, by plug 28, with the left lower segment of the upper disc; thence the current passes by wire 6, through relay 23, to one pole of the battery 11, No. 3.

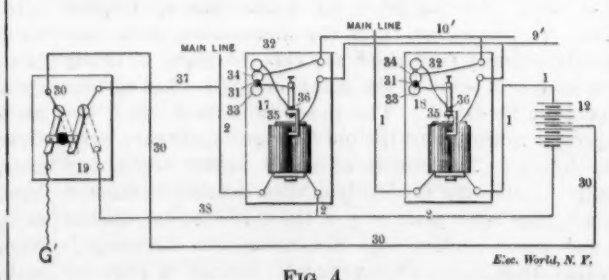


FIG. 4.

From the opposite pole the wire 7 leads to the left lower segment of the lower disc 25″; thence through the plug 29 to the upper half of the disc and wire *c*. The wire 8 from the local battery 22 leads primarily to the relay 23, which closes circuit with the wire 9, leading to the gong 15 and register 16 of the circuit *c c'*; thence the current returns, by the wire 8′, to the other pole of the battery. The other circuits *a a'*, *b b'*, are connected, as usual, with the local battery and their relay 24, gong 13 and register 14. From the wire 8′ a tap or loop 9′ leads to the register 21, gong 20, relays 18, 17, and by wire 10′ the current is led to the wire 8 and to the opposite pole of the local battery. From the centre cell of the exta battery 12 leads a wire, 30, to a double lever switch 19, having a ground-connection *G'*. From the switch 19, wires 37, 38 lead to the wire 2, as shown. Each station *A B C* is provided with a normally-broken ground connection *G*.

Such is the general arrangement of the apparatus, and its operation may well be described before going into a detailed description of the box mechanism shown in Figs. 2 and 3. It may be premised, however, that the latter has a ground connection, normally broken, but so arranged as to close to make the signal. Now supposing a break to occur in any of the circuits—say at *X* in the line *c c'*—the current is immediately broken, and notice is given at the central office by the stroke of the gong 15 and the starting of the register 16, precisely as if the first break of a signal had come in. The plugs 28 and 29 are simply moved over to connect the upper halves of the discs 25″ with the right-hand lower segments, and the double-lever switch 19 is thrown over from its normal position (shown in dotted lines, Fig 4) to the position shown in heavy lines, Figs. 1 and 4. This has the effect of throwing the relay 17 into circuit and of grounding the centre of the battery 12 by wire 30, the transposition of the plugs 28, 29 having changed the main circuit from battery 11 to extra battery 12. Each of the relays 17, 18 is provided with three discs, 32, 33, 34. The discs 34 are connected together and with the wire 9′ from one pole of the local battery, the armatures 35 being connected with the wire 9′ to the other pole of the same battery. The discs 32 are connected with the insulated contact-pins 36 of the relays, and the discs 33 are connected with the metallic frames sustaining the pins 36. Each relay has a plug, 31, to fit between the discs and set up electric connection. The position of the plugs with reference to the discs 32, 33 and 34 determines the action of the relay, making it work on either forward or backward stroke, as may be necessary in the event of the grounding of the wire in case of a break.

The object of grounding the centre of the battery 12 and of locating a relay on each side of it is to guard against the contingency, in the event of a break of the line, of a permanent ground being thrown on at one end, as is very liable to occur should the broken wire fall on a lightning-rod or into the street. In the latter case the grounding is liable to be due to contact of the wire with street-car rails, a lamp-post, or awning support. Obviously, should both ends be grounded, the circuit would be unimpaired; but this is most unlikely to occur.

The break is supposed to occur at *X*, and neither end of the wire grounds. The operator in the central office then turns the switch 19 and moves the plugs 28, 29, as before described, and removes the pin 31 of the relay 18 from its normal position between the discs 32 and 34, and inserts it between 34 and 33, as shown. This has the effect of establishing connection as follows: From the ground—say, at the right of the break—the current passes through the wires *c'* 1 to relay 18, to battery 12, thence through wire 30 to switch 19, and to ground *G'*. From a box to the left of the break the current traverses the wires *c* 2, relay 17, to battery 12, to wire 30 and to ground *G'*.

Now supposing a break to occur at *X*, and the end of the wire to the left to ground on a lightning-rod or otherwise, the current to the right of the break will traverse the course above stated, but to the left a continuous ground circuit is supposed to have been set up. The pin 31 on relay 17 is simply moved to the hole between the discs 34 and 32, causing the relay to work on the backward stroke as before the break. The insertion of the pin between the discs 34 and 32 has the effect to establish the circuit from the wires 9′ to the armature, and thence through the contact-screw 36 to the disc 32, so that circuit is closed as the armature flies back, whereas when the pin is between the discs 34 and 33 the circuit is set up on the forward stroke through the armature-post and the other screw. Of course in case of a ground to the right of the break at *X* the same transposition of the pin on the relay 18 is made. Should both ends ground, no movement of the pins is necessary, as the line is then practically intact. The gong sounds a single stroke at the instant of the break, and the register starts, but instantly stops when the ground is set up.

Tracing out the course of the current, for the sake of clearness, we have in the supposed case a break at *X* and an accidental grounding of the end at the left of the break. The current passes through the wire *c* to the upper half of the disc, through the plug 29, which has previously been moved to the right, to the right-hand lower half of the disc, through wire 2 to extra relay 17, thence by the other wire 2 to the battery 12, by the wire 30 to switch 19, and to the ground. The closing of the circuit has the effect of bringing the armature of the relay 17 against the contact-pin above the magnets, closing the circuit as follows, viz., through the armature, wires 9′, 8′, to battery 22, thence by wires 8 and 10′ to disc 34, thence through plug 31, to disc 33, to post, which holds the pin against which the armature rests. As a result, the gong 20 gives one stroke and the register 21 starts running. The plug 31 is immediately moved to the hole between the discs 34 and 32, breaking the local circuit. As any box to the left of the break is now operated its circuit-closer makes and breaks circuit on the disc, the

breaking of the circuit as it passes between the teeth allowing the armature on the relay 17 to fly back against the contact-pin 36. As it touches the pin a local circuit is set up as follows: Through the armature, wires 9′, 8′, to battery 22, thence by wires 8 and 10′ to disc 34, by pin 31 (which is now between 34 and 32) to 32, and thence to contact-screw 36.

There are therefore three supposable cases in the event of a break in the line, namely: a dead break and the grounding of either end, for we may lose sight of the possibility of both ends grounding at once. Until the break is repaired or the pins 31 are properly placed, the register continues to run. In the event of a dead break, the pin of relay 18 is lowered. Should the left end of the line ground, the pin in relay 17 is raised to the upper hole and that in 18 moved as before; and should the right end ground, the pins are undisturbed from their normal positions, only the switch 19 and plugs 28, 29 being moved. A minute's experimenting with the pins 31 determines the case in point, for there are but three possible arrangements of the pins to meet any possible case. In the event of a break in either of the circuits *a a′* or *b b′*, the plugs 26 and 27 are simply moved to the right, so as to set up connection between the upper half and right lower segments of their discs.

As above stated, the ground connections of the various boxes are normally off, but provision is made for making and breaking circuit with the ground as the signal-box is operated. In Figs. 2 and 3 is shown the box mechanism for this purpose. The latter is of the usual form, being furnished with clamps *L′ L″* for the main-line wire, one end being soldered to the frame *h*, the other being attached to a lip *k*, on the insulating-block *K*. The lip *k* bears on the periphery of a disc *J′*, having notches to break and make circuit, whereby, when the disc revolves, the signal is transmitted. So far as described, the box is of the usual and well-known form. But there is added thereto a ground connection from the clamp *L*, and the latter is connected with a second lip *k′*, on the block *K*, arranged so as to make and break circuit with a second disc *J*, soldered to the face of the disc *J′*, and concentric therewith. The disc *J* is smaller than the disc *J′*, and the lip *k′* does not touch its periphery. The disc, however, is provided with a number of properly spaced teeth *j*, which project far enough to touch the lip *k′* as the disc revolves, and make circuit. In operation, as the crank is turned the arm *i* passes clear of the pin *j′* and the discs turn, sending the signal to the central office. As long as the line is intact the signals are transmitted thereby. The ground is thrown on at the box, but not at the central office. In case of a break in the line at either side, the operator throws on the ground at the office, and the current, entering the box by the unbroken wire-connection, returns through the ground as the box is operated.

The advantages of the system which has been introduced by the Viaduct Manufacturing Co., of Baltimore, are apparent. They have also been evidenced by a prolonged trial in practical work.

The occurrence of a break is instantly made known at the central office by the stroke of the gong and the starting of the register. It is obvious that the boxes on both sides of the break being grounded when in operation, all the signals are recorded, and what was theretofore a closed metallic circuit becomes after the break two circuits, each having a ground return. These circuits are just as efficient as the closed metallic circuit, and a single break is thus productive of no bad result. As soon as one occurs, however, a lineman is sent out to repair it, because, until this is done, a second break on either side of it will cut out all the intermediate boxes. This contingency can manifestly not be guarded against, but it is very remotely possible that a second break will occur before the first can be repaired.

Annual Meeting of the Telegraphers' Mutual Benefit Association.

The twentieth annual meeting of the above association was held in room 30 of the Western Union Building, on Wednesday afternoon, Nov. 17. The meeting was called to order at four o'clock by the President, Mr. A. R. Brewer, and the proceedings lasted until about half-past seven. The attendance was considerably larger than usual, and included, probably for the first time, two of the lady members, and much intelligent interest was shown by the delegates and members present in the different matters that came up for discussion.

Among the New York members present were Messrs. Merrihew, Cockey, Dealy, O'Leary, Redding, Baker and Edwards, in addition to Secretary Bruch and Treasurer Mackay. Baltimore was represented by R. J. Bloxham; Boston by G. L. Lang; Chicago by Messrs. Jos. Uhrig and W. J. Lloyd; Columbus by Messrs. A. M. Paddock and H. E. Rawson; Jersey City by I. A. Van Dusen; Philadelphia by S. S. Garwood, I. D. Maize, J. Wintrop and R. C. Mecreedy; and Pittsburgh by S. A. Duncan and M. M. Prescott.

After the question of credentials had been attended to, President Brewer made a brief address, in which he said: "It is a pleasure to welcome so many members to the annual meeting, and to see the yearly recurring evidence of the interest of the members in the association. Again, as in last year's report, I have the pleasure of stating that the number of members of both divisions has increased from the preceding year, the reserve fund has increased, and the number of assessments has again been reduced. The Secretary's report will show a gain of over 8 per cent. in the membership of the First Division and over 17 per cent. in that of the Second Division. The reserve fund is now within $9,000 of the limit fixed by the by-laws. If the death rate does not increase, it is hoped that the fund will soon reach the limit for the existing membership. The steady and healthful growth of the association during the past year will be shown in detail by the reports of the Secretary and Treasurer, which follow."

The annual reports of the Secretary and Treasurer were then read, and showed the affairs of the association to be in the following satisfactory condition:

	1st div'n.	2d div'n.
Membership, as per last annual report.	2,872	323
Members admitted during year.....	316	62
	3,188	385
Members lapsed.....64		3
" died 22		3
—	86	— 6
Membership, October 30, 1886.....	3,102	379
Net gain during the year.....	230	56
RECEIPTS.		
Balance cash on hand, as per last report	$9,233.30	$60.42
Received account of assessments, fees, etc.....	29,702.15	905.00
Received account of sundries.....	20	
" " " interest.	3,077.42	10.00
Total income.	$42,032.87	$975.42
DISBURSEMENTS.		
Death claims.....	$24,900.00	$308.70
Bonds account reserve fund.....	6,757.50	
Medical examinations	253.00	17.00
Fees refunded	21.00	
General expenses.....	2,768.95	111.82
Total disbursement.....	$34,698.45	$437.52
Balance cash on hand.....	7,334.42	537.90
Total.....	$42,032.87	$975.42
Balance due on assessments, etc.....	3,109.64	302.00
Reserve fund (par).....	$48,000.00	

Heretofore assessments have been levied upon members without regard to the age at which they joined the association. An amendment to the by-laws was adopted at this meeting, however, providing for the grading of assessments of new members after January 1st, 1887, when the amendment takes effect. After that date the assessments will be levied according to the following schedule:

Upon members admitted prior to, and in good standing on January 1, 1887.....	$1 00
Upon members admitted on and after January 1, 1887, whose age at entry shall be between	
18 and 30	1 00
30 and 35.....	1 25
35 and 40.....	1 50
40 and 45.....	2 00

The question of allowing compensation to agents was fully discussed, and the matter was referred to the Executive Committee for further consideration, with power to allow compensation for the coming year, to an amount not exceeding an aggregate of $500, if, in the judgment of the committee, such action is advisable.

The following officers were re-elected: President, A. R. Brewer; Vice-President, W. H. Young; Secretary, Charles P. Bruch; Treasurer, E. T. Mackay; Members of the Executive Committee, Jos. Uhrig, Chicago; C. W. Hammond, St. Louis; W. B. Gill, Philadelphia; J. Merrihew, J. L. Edwards, New York; Auditing Committee, S. S. Garwood, M. J. O'Leary, W. J. Dealy.

On behalf of the Western members, Mr. Uhrig extended an invitation for the Association to hold its next annual meeting in Chicago. It was the desire of those present that the next meeting should be held at Chicago, but the New York laws require the holding of the annual meeting in this State. The invitation was, however, accepted and referred to the Executive Committee with a recommendation that the meeting be held in Chicago next year, if practicable, even if a meeting be subsequently held in New York to ratify what may be done at Chicago. After a vote of thanks to the officers and agents the meeting adjourned.

Annual Report of the Signal Service.

The chief signal officer has transmitted to the Secretary of War his annual report showing the operations of his bureau during the last fiscal year. The report begins with a statement of the value of the instruction afforded at Fort Myer, and the services of the signal corps attached to General Miles' command during the Geronimo campaign are cited as evidence of the utility and necessity of trained signal officers. Regret is expressed at the action of Congress in failing to provide for a continuance of Fort Myer as a post of instruction.

General Hazen says that the progress made in indicating the approach of cold waves has been highly satisfactory, and he is convinced that property to the value of many millions of dollars has been saved through the agency of this service. An appropriation of $5,000 is recommended for the extension of the service, and the opinion is expressed that no appropriation would be more acceptable to the people. Of the 1,065 cold-wave signals displayed during the year, 911, or 85.5 per cent., were justified.

Of the utility of the flood warnings furnished by the Signal Service the report says a careful estimate shows that property valued at $128,000 was saved at a single station (Nashville, Tenn.) by the flood warnings of the Signal Service on the Cumberland River during March and April of the current year. The expense of the government in communicating the above warnings to all stations of that system, including pay of river observers, was $27.80. This single example illustrates what is being done in the whole system.

The chief signal officer suggests that some substantial reward should be given to the members of the International Polar Expedition, and hopes that Congress at its next session will recognize the successful work performed by Lieutenant Greely and party by providing promotions of the survivors and support for the families of those who lost their lives while serving with this expedition.

The report closes with recommendations looking to the establishment of additional cautionary stations on the lakes, the purchase, at a cost of $108,000, of new buildings for the accommodation of the bureau, and the enactment into law of the recommendations of the joint commission of Congress relative to the tenure of office and promotion of officers of long experience.

The Medical Uses of Electricity.

At the last meeting of the Buffalo Electrical Society, Dr. J. D. Bonnar read an interesting paper on the above subject.

"Electricity," said the lecturer, "is essentially a stimulant, but according to the particular kind used to affect the human system we find higher or lower excitation produced. That which is produced by means of the friction electrical machine gives a sharp, quick stimulation to the body, while the kind generated in the voltaic battery gives a slower stimulation. The induced current as produced by the galvano faradic battery is of a high stimulating quality, and is denominated the secondary current, in contradistinction to the primary, which is the direct current from the voltaic cells. It may be laid down as a fundamental principle that there are just two great diseased conditions, one of which electrically considered is positive, or in medical language hypersthenic, while the other class is considered negative, or asthenic. Under the positive we include all such as are attended with inflammation, congestion, soreness, acute pains, bruises, fevers, sprains, extranious growths, expanded muscles and swellings of all kinds. Under the negative are included paralysis, local or general debility, contracted muscles, nervous prostration, coldness of the extremities, torpid liver and inaction in any part of the system, with atrophy or tendency to decomposition local or general. In disease there is an unbalanced condition of the electro vital forces, and our bodies may be considered as an aggregation of delicately arranged organic compounds and simple elementary tissues, each of which possesses electrical qualities. When any agency, internal or external, produces a polarity or accumulation of either body in greater amount than naturally belongs to any portion of the system, then are produced the various symptoms of disease in that surcharged part, and hence we conclude that the great requisite in curing the disease is the removal of the excess of electricity, or, in other words, to change the direction of the current to other parts of the system, and as we have already shown that positive repels positive and negative repels negative, while positive attracts negative, we can quite readily comprehend the rationale of treating by electricity the various forms of disease."

Referring to that class of electric phenomena known under the title of animal electricity the lecturer remarked that electricity could be generated by pressure, percussion, vibration, cleavage, combustion, evaporation, heat, chemical action, friction, etc., so that by the operation of any or all of these actions the body may receive electrical supplies. This explains the usefulness of friction upon the surface of the body, as a remedial measure, and a silk towel applied in cases of weakness is often of much service. As evaporation generates electricity, it follows that when from any cause our bodies are thrown into active perspiration electricity is carried off, and with it a certain amount of heat, the latter converting the moisture into vapor which conducts the electricity away. Hence the importance of keeping the body and clothes free from dampness.

After giving a description of some of the applications of electricity in the field of surgery, as for example in the cauterizing or puncturing of wounds, amputation of tumors, etc., the lecturer concluded by saying: "If there were no other purpose to which electricity was applicable than this latter in the domain of conservative surgery, its importance would be difficult to estimate, but as it is of immeasurably wider scope in its therapeutic application, not to speak again of the magnitude of its usefulness in the arts, we have inexpressible reasons for gladness and gratitude that this is the age we live in, and that electricity in such numerous ways is useful to man. Let us hope that this and other electrical societies may be the means of evolving still further the mysteries of this unseen potential."

George W. Felton, of the Western Union office, Chicago, will read a paper on "Ocean Currents" at the next meeting, to be held on Dec. 3.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Nov. 22, 1886.

The Empire Electric Manufacturing Co., of Brooklyn, L. I., has been incorporated this month with the following directors: J. W. Fowler, D. F. Lewis, Abiga Haviland, John J. Bryers, all of Brooklyn, and Ch. Van Anglen, of Jersey City, N. J. The company has been organized for the purpose of introducing J. I. Conklin's telegraph instruments, which are made by the Lewis & Fowler Manufacturing Co., of 27 to 35 Walworth street, Brooklyn, L. I. The company has a number of other electrical specialties which it intends to produce, and I understand that it has acquired property in the vicinity of its present location upon which it is intended to erect a building which will afford increased facilities. The circular of the company, describing the new Conklin apparatus, is quite interesting, and contains testimonials of merit from a number of railway telegraphists.

At the American Institute Fair now being held in this city, Messrs. Waite & Bartlett are exhibiting a large variety of electro-medical apparatus. Among them the large improved Holtz machine attracts attention, both on account of its size and the beauty of its finish. It has ten revolving plates 36 inches in diameter, of plate glass. The improved cat-skin charger is mounted on the end of a rod in such a manner that it can be made to sweep the entire surface of the outside plates. There is also exhibited an improved crown holder which is attached to the machine when it is desired to give an electric "wind bath." The crown holder is suspended from the top of the machine on an extension rod, or can be suspended at a distance from the machine and connected to the latter by a metal chain. I recently submitted to one of these "wind baths," sitting upon an insulated chair, and must pronounce the sensation a delightful one.

The Excelsior Electric Company, having completed the large installation at Canandaigua, N. Y., the lights were started last week amid the usual expressions of delight on the part of the citizens. The arc lamps to the number of 90 are constructed after Mr. Wm. Hochhausen's most improved designs. Quite a lively competition was called forth in the furnishing of this plant, which is operated in connection with the water-works of the town. The length of the circuits exceeds 25 miles and 126 poles are employed. The opinion of the citizens is unanimous on the efficiency of the Excelsior system.

I might add also that the Excelsior Electric Co. is fitting out with arc lamps the caisson employed in the construction of the new Harlem River bridge in this city.

The Sawyer-Man Electric Company has just issued a new pamphlet setting forth the nature of the incandescent light furnished by it, and the uses to which it can be put. It also contains the answers to the numerous questions which intending purchasers usually ask, and this gives a means of judging the probable cost of a plant. The pamphlet also contains the notice of the fact that the Sawyer-Man Company installs the Thomson-Houston arc lights in connection with its incandescent plants, as well as individually. A large number of testimonials of the Sawyer-Man system is also embodied in the text.

Messrs. Chas. A. Schieren & Co., manufacturers of the "Electric" leather belting, inform me that they have just filled a large number of orders for electric light companies in various cities.

At the American Institute, Mr. E. A. Petit shows an electric low-water alarm, comprising two gauge cocks, a water gauge, mercurial tube or thermometer, two Leclanché batteries and a vibrating alarm bell. Its operation is simple. Two wires are inserted in the mercurial tube and connected with the batteries and bell. As the water in the boiler gradually lowers, the steam comes down through the upper arm and gauge glass, and when a certain level is reached it enters also through the lower arm. Being hotter than the water the increased temperature of the steam expands the mercury in the tube, making the electric connection between the two wires which communicate with and sound the alarm. The bell continues ringing until sufficient feed-water has been supplied, which, being cooler, contracts the mercury, breaking the circuit, and the alarm ceases.

The Continental Iron Works, at Brooklyn, which are now largely devoted to the construction of gas-works throughout the country, will be lighted by the American system this week.

The new alliance between Mr. Goff, of the American System of electric lighting and the managers of the gas companies is not only making the American popular with the gas fraternity, but is giving a great impetus to the American Company's business. The gas company at Orange, N. J., is the last acquisition to the American ranks. This company contracted with the American Company last week to install a fifty-light machine at once for street lighting.

The new works of the Sprague Electric Railway and Motor Company, at Eleventh avenue and Thirtieth street, this city, are now being rapidly equipped with the most improved machinery for turning out the finest work. It is intended to carry on only special work in these shops. I am informed that over one hundred motors are now in course of construction, and that during this month twenty-five have been shipped up to date. The motors, varying from ⅓ to 10 h. p., have gone to Boston, Lancaster, Annapolis, Pawtucket, Springfield, Topeka, Detroit, St. Louis and other places. The orders on hand and awaiting shipment will keep the company busy for some time to come. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Nov. 22, 1886.

The Newton (Mass.) Aldermen, at their meeting on Monday evening, Nov. 15, granted several privileges to the Newton Electric Light and Power Company.

On same evening the Waltham (Mass.) Aldermen adopted an order allowing the Electric Light Company of that city to place twenty-five arc lights on the principal streets, this being the first formal step toward lighting the Waltham highways with electric lights.

The Lynn (Mass.) Aldermen recently received a proposition to light the City Hall of that city by the incandescent system of the Sawyer-Man Electric Company, and it was referred to the Committee on Public Property.

The Clinton (Mass.) Gas Light Company has filed a petition in the Secretary of State's office asking the Legislature for authority to increase its capital stock to a sum not exceeding $250,000, and to furnish Clinton and Lancaster with electric light and power.

The Roxbury (Mass.) Gas Light Company has also petitioned for authority to furnish electric light to that part of Boston which it is now authorized to supply with gas; and to own and erect all apparatus and wire necessary for that purpose.

Reports from Amesbury, Mass., are damaging to the reputation so long enjoyed by that town for enterprise and thrift. It is said "that owing to failure on the part of the authorities to encourage with promised patronage the electric light company recently started there, the town was enveloped in darkness on the nights of Nov. 15 and 16."

It is yet a matter of uncertainty as to which electric light system will be adopted by the authorities of Cambridge, Mass., for lighting the streets of that city. A hearing was given Nov. 17 on the petition of the Thomson-Houston Electric Company for permission to erect poles in the city, but was closed without action being taken. The Cambridge Electric Light Company (Weston system) appeared in remonstrance.

The Edison United Manufacturing Company, through its New England agents, Messrs. Paine & Francis, has just installed an incandescent light plant of 150 16 c. p. lamps on the premises of the Plymouth Cordage Company, Plymouth, Mass. The same gentlemen filled orders for an increase of 200 16 c. p. lamps to N. J. Simonds, Woburn, Mass., and an increase of 200 16 c. p. lamps to Messrs. Stevens & Company, Haverhill, Mass.

The Sawyer-Man Electric Company, through its New England agent, Mr. P. H. Alexander, is installing incandescent light plants as follows: Roxbury Carpet Company, Roxbury, Mass., and Abbott Worsted Mills, Graniteville, Mass. Mr. Alexander reports the recent increase in the number of lights of his company's system (200) at the Montague Paper Company's Mills, Turner's Falls, Mass.

There is at present an unprecedented activity among all the other electric companies (not already mentioned) doing business direct or through agents in this section. Col. H. M. French report the Ball Electric Light Company (of New England) as having several large contracts in hand. He has just commenced the installation of a large arc light plant at the works of the Clark's Cove Guano Company, New Bedford, Mass.

The Sun Electric Company, of Woburn, Mass., and the Schaefer Electric Manufacturing Company, of Cambridgeport, Mass., are seeking to satisfy the large demands for the excellent incandescent lamps of their respective manufacture.

The Thomson Houston Electric Company is still behind its orders for several thousand arc lights, and at the rate new orders are being filed but little hope exists of catching up until the machinery is all in the new Lynn factory and a larger force is added. The same rush and push is manifest among the large manufacturers of electrical goods in and near Boston. Thus Messrs. Fuller & Holtzer have found it necessary to erect a new factory in Brookline, Mass., which, with increased facilities for manufacture, will enable this enterprising firm to give their regular customers prompter attention in the future.

The Boston Electric Company having but recently become settled in its doubly-enlarged quarters (equipped with new machinery), and increased its working force from sixty to more than one hundred men, is yet unable to give its attention to the manufacture of certain novelties in the electrical line on which it holds patents. Its time is at present fully taken up on orders for the standard lines of electrical supplies.

Mr. A. L. Russell, the successor of Charles Williams, Jr., is also crowded with orders from all sections of the country for telegraph and telephone instruments and experimental apparatus.

The Redding Electrical Company is enjoying a heavy run on its hotel and house annunciators and electric bells, and the filling of orders in experimental work for inventors and others. An important enterprise has been added to this company's business, and which augurs well to bring the Redding Company even more prominently before the public.

Messrs. Blodgett Bros. & Company are also busily engaged on hotel, house and club annunciators, and have recently done some very attractive work in this line.

The Electric Gas Lighting Company, with all the enlarged manufacturing facilities afforded by its new factory into which it recently moved, and the increase in the number of its employés, has found it necessary to purchase more new machinery, and will again take on more skilled workmen.

The Brookline (Mass.) Board of Selectmen held a meeting on the afternoon of Nov. 15, and gave a hearing to several parties on the fire-alarm telegraph matter, and a committee was appointed to examine into the subject and report later.

The Woodward Underground Telegraph and Telephone Company has petitioned the Malden (Mass.) Board of Aldermen for the right to lay wires through the streets of that city. The communication was referred to the committee on highways.

The following item, headed, "Working the Wires," appeared in the Boston *Evening Record* of recent date: It is said that Alderman P. James Maguire is so much exercised over the coming election that he is using every expedient to secure a re-election, and that, not being able to put as many of his constituents at work in the city departments as he desires, he has gone outside and sought work for them in digging up the streets to lay telephone wires under ground. Some of his supporters "got on" to this a few days ago, and since then the alderman has been kept busy attending the small army of laborers who have followed him up day and night.

The Chelsea (Mass.) Aldermen have been petitioned by the New England Underground Telephone and Electric Company for leave to open streets in that city to lay underground wires from branches in Salem and Lynn to the main office in Boston, and the communication was referred to the street committee. Diligent search and inquiry in Boston and Chelsea fail to disclose the whereabouts of such a corporation.

A new device will soon be tested, which it is claimed will make railroad traveling almost absolutely safe. The Boston & Lowell railroad is putting down six miles of an automatic electric signal, for the purpose of giving the invention a thorough trial, with the intention, if successful, of adopting it for the whole road. This signal gives the engineer in his cab notice every mile whether the road ahead is safe; with no train on the track, no open switches, or broken rail.

The students of the Massachusetts Institute of Technology met Saturday evening, Nov. 13, at the Parker and Quincy houses, on the occasion of the first meetings of the season of the '87, '88 and '89 class associations. The class of '89 dined at the Quincy House, thirty-five present. The '87 association met at Parker's, thirty four in attendance, with H. D. Sears at the head of the table. The society of '88 also dined at Parker's, with about twenty in attendance.

The Bridgeport Malleable Iron Co.'s works, at Bridgeport, Conn, will be lighted by the American system this week

Mr. E. H. Batchelor, sole agent of the Campbell insulated wire and tapes, recently showed me a variety of samples of the T. Z. R. electric light and telegraph wires. The insulation seems calculated to withstand all influences of weather, and its fire-proof qualities have been fully approved by the superintendent of the Boston Board of Fire Underwriters. The wire is also recommended to its customers by the Thomson-Houston Electric Company, and has called forth testimonials from other electric light companies. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Nov. 22, 1886.

The Bell Telephone Company was handled without gloves by the City Councilmen on Thursday last. The discussion became very lively. It arose over a resolution empowering the American Telegraph and Telephone Company to lay branch cables and conduits. Mr. William M. Smith advocated the bill. Mr. Hoffman said the company had done nothing to show that they should have any privileges granted them. Mr. Abrams declared that they had put up wires before applying to the city for permission. Mr. Smith pronounced the statement incorrect and unfair. Mr. Hoffman jumped up, and, extending his arm by way of emphasis, exclaimed, "I say the statement is true." Mr. Smith said it was the desire of the company rather to benefit the business interests of the city than to benefit themselves. Mr. Claghorn remarked that the way in which the pavement at Sixth and Walnut had been put down was disgraceful. Mr. Fow asked how the gentleman from the Twenty-seventh crossed Sixth and Walnut on his way to Councils; and was he aware of the fact that the company, with leave to open five hundred feet of street, had opened one thousand. Mr. Smith had crossed Sixth and Walnut on dry ground, and was *not* aware of Mr. Fow's "fact." Mr. Hoffman said this corporation deliberately tore up Delaware avenue, from Tun alley to Walnut street, and when that was stopped they strung wires from their office to Third and Walnut. He earnestly advocated a reference to the committee. Mr. Kenton confirmed the statement about the Walnut street pavement, and the bill was referred to the Electrical Committee.

At the last meeting of the Electrical Committee of City Councils, the estimate of the appropriation for the Electrical Department (the Police and Fire Alarm service) for next year was considered and approved. A brief synopsis of the allowances will give some idea of the magnitude of the city's electrical bureau. The amount granted to carry on the work of the department next year is $180,014. The salary list is increased to $21,300, a janitor, two inspectors, a lineman and three operators being added to the force. Ten thousand dollars is to be expended in improving and extending the Police and Fire Alarm system. The electric lighting will cost $77,761. Of this amount $40,000 is to be used for additional electric lights. The rooms for the use of the Department in the new City Hall—their thorough and elegant equipment has already been described in these columns—are now being fitted up, and the entire plant will probably be removed from the historical locality of Independence Hall before the first of January.

An attachment issued by the United States Circuit Court on the claim of the Benedict & Burnham Manufacturing Company of Connecticut for $7,601.22 for supplies, with interest, was served on Saturday last by United States Marshal Kerns on the personal property of the American Sectional Electric Underground Company.

With regard to the subject of copper gradually superseding iron as an electrical conductor it may be of interest to a good many of your readers to note that a firm in Trenton, N. J., claims to have used more than 1,000 tons of copper in the manufacture of telephone and telegraph wires.

The Baron and Baroness Edmond de Caters are spending a few days in this city. The Baron is the friend and adviser of M. Edmond Julien, the inventor of the system of electric tram-cars now being tried in New York.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Nov. 20, 1886.

The third annual ball of the Kansas City employés of the Missouri & Kansas Telephone Company is to be held at the Merchants' Exchange Hall, Kansas City, on Thursday evening, Dec. 16, 1886. The thanks of this office are due to Mr. D. B. Macquarrie for an invitation to be present.

The Ft. Wayne Jenney Electric Light Company makes the following excellent showing of new business, all of which, with a single exception, has been secured within 30 days. Orders have been secured for the City of Mexico, Mexico, 30 lights; the panorama, Cleveland, O., 30 lights; the panorama, Kansas City, 30 lights; the panorama, Minneapolis, Minn, 30 lights; M. Lassig, Chicago, 16 lights; United States Government, for the canal at Louisville, 25 lights; Columbus, O., Buggy Company, 30 lights; Seattle Gas Company, Seattle, Washington Ter., 70 lights; Missouri Car and Foundry Company, St. Louis, 46 lights; Lyons, Iowa, 90 lights; Paris, Ill., 46 lights.

A large number of additional lights have also been booked to those already installed, notably an increase of 250 lights for the Louisiana Electric Light and Power Company, of New Orleans.

The Electric Light and Power Company, at Ft. Wayne, using the Jenney system, is now running 475 arc lights.

I mentioned, in a notice in these columns a few weeks ago, the fact that the Ft. Wayne Jenney Company is now occupying its new factory, and I will add that plans have already been submitted for adding still further to the shop capacity of the establishment.

It seems that they no sooner get one building up before they need another, and when the plans contemplated for next spring are carried out the company will have one of the most complete electric light establishments in the country.

The People's Telephone Company of Chicago has been incorporated.

My Kansas City correspondent furnishes the following bit of interesting gossip: "Kansas City, and this part of the West, still continue to prosper commercially and electrically. The Kansas City exchange continues to add from thirty to seventy-five subscribers each month. New toll lines and increased facilities for old lines are talked of, and the impression seems to prevail that the toll business should be improved and extended to the utmost, and this because of the much larger percentage of earnings to expense as distinguished from exchange business; and it is doubtful whether the growth of Kansas City will even partly reach the enormous figures of the real estate dealers.

"Meanwhile the Kansas City Council continues its investigation of the underground question, and I hear that the chairman of the committee, to whom the underground matter was referred, has seriously thought of giving up the business of charging four per cent. per month for small loans, and is contemplating writing to Mr. Edison for a partnership; and this after reading Mr. Lockwood's work on the telephone. Then again we have a very odd sort of a mayor to contend with. He amuses himself frequently by calling special sessions of the city council to pass license fees against corporations.

The St. Paul Gas Company was about the first gas company in the United States to adopt the electric arc light. They use the American, and are now increasing their plant. President Goff, of the American Company, will be West in a few days, I understand, to consult with the officers of the gas company about an increase of the electric light plant sufficient to light the entire streets of St. Paul. The St. Paul Gas Company are the general agents for the American Company in the State of Wisconsin.

"It is rumored that a basis for the consolidation of the United with the Missouri & Kansas Telephone Company has been agreed upon, and the ratification by the stockholders is all that is now necessary. The Nebraska Company will fall into line before very long, and before many years the telephone interests will be represented by half a dozen companies. Such a course being more profitable to the parent company, it is bound to be accomplished."

A company has been formed for establishing an Edison incandescent light plant at Topeka, Kan., and the Western Electric Company has sold several electric light plants for towns in that State.

You would hardly expect the judges of a fat stock show to be competent electric light experts, but they evidently know a good apparatus when they see it, and they also seem to appreciate a satisfactory light, for they have just granted to the Sperry Company, who very successfully lighted their show, a premium for the best arc light.

The Sperry Company, by the way, has just put in a 20 arc-light plant at Philadelphia, another in Bundy's confectionery store, Chicago, and has also sold a 20 arc-light plant to the Knickerbocker Ice Company.

Mr. J. D. Calloway has been appointed agent and operator of the St. Joseph & Iowa Railroad at Rushville, vice George W. Watson, resigned.

Mr. W. J. Ryan has been appointed chief train dispatcher of the East Iowa Division of the Rock Island road, with office at Davenport, vice B. Bailey, transferred to the new lines west of the Missouri River.

As showing the demand for engines from electric light plants, here is a list of late sales made by the New York Safety Steam Power Co., Chicago branch, 64 South Canal street:

Sperry Electric Light Company, city, 16½ by 7 vertical engine.

Fort Wayne Jenney Electric Light Company, for Cincinnati, O., two 5½ by 7 vertical electric engines.

Fort Wayne Jenney Electric Light Company, for Shelby's Academy, city, one 6½ by 7 vertical electric engine.

Fort Wayne Jenney Electric Light Company, for Vicksburg Wharfboat and Elevator Company, Vicksburg, Miss, one 9½ by 7 vertical electric engine.

Fort Wayne Jenney Electric Light Company, for A. J. Sweeney & Son, Wheeling, W. Va., one 3½ by 5 vertical electric engine.

St. Paul Electric Light and Power Company, for St. Anthony Elevator Company, Minneapolis, Minn., one 8 by 9 horizontal automatic cut-off engine.

Columbus Electric Light Company, Columbus, O. (fifth order), one 12 by 12 horizontal, automatic cut-off engine.

Col. S. G. Lynch, broker, of 146 La Salle street, Chicago, furnishes me the following telephone stock quotations:

Bell of Mo.	$150@$152
Central Union	45@ 47
Chicago	375@ 400
Colorado	20@ 22
Cumberland	75@ 80
Great Southern	25@ 27
Iowa Union	16@ 19
Michigan	69@ 70
Rocky Mountain Bell	40@ 45
United	17@ 19
Wisconsin	104@ 106

W. A. K.

THE TELEGRAPH.

The French Cable Company bases its demand for higher rates on its inability to accumulate at present rates a reserve fund large enough to repair its cable in the event of an accident.

A Missing Telegraph Man.—A dispatch from Boston says that Daniel J. Marra, assistant to Cashier Harlow in the Boston office of the Western Union Telegraph Company, has been missing for a week, and his family and friends are fearful that he has met with an accident or has become the victim of foul play. The cashier, Mr. Harlow, says that Marra's accounts are all correct and that there is no money missing. Marra was in New York on Sunday, Nov. 7, and a telegram was received from him stating that he had missed connection, and that he expected to return to Boston the next day. Since then nothing has been heard from him. He has a wife and infant child.

Effects of the Storm.—The severe storm and high wind last week rendered useless all telegraph wires between New York and New Haven, Conn. Poles were leveled in many places. Trouble was also reported with the wires in other directions. In Boston the wind was so high in the forenoon that the top section of the flag-staff on the dome of the City Hall had to be unshipped and lowered, as the flag, even at half mast, gave it a great strain. The fire alarm, telephone and telegraph wires throughout the city were badly broken and disarranged by the gale. The highest velocity of the wind was at one o'clock—forty miles per hour. The derangement of the wires is attributable as much to the heavy rain as to the high wind. Very few reports were received at the signal office during its continuance.

The B. & O. Telegraph Company.—At the annual meeting of the Baltimore & Ohio Railroad Company, held in Baltimore on the 15th inst., President Garrett in his report said: "The increase in the earnings of the Baltimore & Ohio Telegraph Company for the fiscal year ending Sept. 30 has been 172 per cent. compared with 1884, and 41.25 per cent. compared with 1885. In the midst of acute competition, the large and increasing patronage thus commanded demonstrates the strength of the company and the value and efficiency of its service. "The fact is that the telegraph company, in addition to its value in facilitating the varied business operations of the railroad company, has not only paid to that company the agreed annual rental for the use of the wires on its railroads not needed for railroad purposes, but has also shown a satisfactory net earning capacity."

The Block Island Cable.—The laying of a cable to Block Island, off Newport, R. I., was successfully accomplished last week. The cable runs from Block Island to a point on the main land about three miles west of Point Judith, and while laid for the government in connection with the Signal Service, is also used for commercial traffic, which had been interrupted for over a year on account of the failure of the old cable. The core of the new cable is composed of a strand of copper wires, 107 lbs. to the mile. The insulation is of gutta-percha, 150 lbs. to the mile, and the armor consists of twelve No. 3 galvanized iron wires. The cable was laid on Nov. 16, the steamer leaving New York on the 11th inst. and returning on the 20th. The expedition met heavy weather and rough seas, but were fortunate in getting enough fair weather to put down the cable under the most favorable conditions. The cable was furnished by Messrs E. S. Greeley & Co., and was laid under the supervision of Mr. M. W. Goodyear.

Strike of Messengers.—Between 300 and 400 messenger boys employed by the Mutual District Telegraph Company went out on strike last Saturday morning, principally in the up-town districts of this city. At the station at No. 763 Madison avenue the strikers broke several panes of glass, and two of the boys were arrested. The strikers seemed to bear a particular hatred against Superintendent Spellman, and whenever they saw him on his rounds they invariably hooted him. The boys have been complaining for over a week past that they were worked 13 days in every fortnight, and were not paid for the Sunday they had off. They say they were paid $4.50 a week, and if one of them absented himself he was fined $2.38. They demanded that the fine be abolished, and that they be given every Sunday off without reduction of pay. The officers promised to take the demands into consideration, whereupon most of the boys returned to work. Some of the superior employés state that the fine for absence was only 50 cents, in addition to the deduction of that day's pay, and was not excessive. The company could not afford to give a holiday every Sunday, as that would leave it without any boys on that day. Half the boys were let off every other Sunday. General Manager Ryder said later that a satisfactory arrangement had been made with the boys, and that they would not strike again. The company has nearly 1,500 boys in its employ.

THE TELEPHONE.

In Public Schools.—There are three telephones in use in the West Chester public schools, and since the advent of young lady operators on the switch-board in the West Chester exchange the service is said to be much better.

Cutting Off "Deadheads."—It is stated that the exchange at Nasbville has been successfully making the laudable effort to put a stop to use of the telephone by "deadheads." It is said that most of the subscribers are in sympathy with the exchange.

Lexington, Ky.—A dispatch from Lexington, Ky., of the 2d inst., says: "The meeting of the Chamber of Commerce to-night was one of the stormiest. The telephone company of this city has been supplying the subscribers at $51 per year, but recently they gave notice that as their time expired the rate would be increased to $60. A resolution was passed requesting the City Council to take such action as will require the telephone company to make reasonable charges for service. A resolution was then offered and unanimously adopted requesting the citizens to give them no further support except at the old rates. Great feeling is expressed on both sides, and a fight is expected."

Roscoe Conkling and Prof. Bell.—A dispatch from Washington relates the following story: Mr. Conkling was engaged in a great patent case—a class of practice which he particularly affects. He was for some time the counsel of Prof. Bell, of telephone fame, but it is reported that the connection has ceased. The rumor runs thus: That Prof. Bell remarked in conversation that the highest-priced counsel did not always do the most work, and instanced Mr. Conkling as demanding large fees and of being of no substantial value to the telephone company. This reached Mr. Conkling's ears and caused him to remark that Mr. Bell, and his telephone, too, might go to limbo. This is given strictly for what it is worth, and a good many people believe it.

THE ELECTRIC LIGHT.

Naugatuck, Conn.—An electric light company, with a capital of $15,000, has been organized at Naugatuck.

Lynn, Mass.—The Lynn Electric Light Company is increasing its plant materially, and has just ordered a fifth Westinghouse engine of 100 horse-power.

Hudson, N. Y.—The Electric Light Company, Hudson, N. Y., has been incorporated. Capital stock, $30,000. H. Hermann Westingham, and others, incorporators.

Kankakee, Ill.—The Kankakee Electric Light and Power Company, Kankakee, Ill., has been incorporated. Capital stock, $20,000. Walter W. Hatch and others, incorporators.

Stafford Springs, Conn.—The Mineral Springs Manufacturing Company, Stafford Springs, is introducing electric lights into its mill. The dynamo will have a capacity of 150 incandescent lights.

Kansas City, Mo.—The Edison Electric Light and Power Company, Kansas City, has been incorporated. Capital stock, $100,000. Kersey Coates, 1002 Penn street, and others, incorporators.

Sandford, Me.—J. B. Clark is making preparations for lighting Sandford by electric light. He will use Chapman dynamos and is having a steam engine built expressly for the purpose of driving them.

Saco and Biddeford, Me.—The Saco and Biddeford Electric Light Company will be organized in Biddeford with a capital stock of $30,000. It is stated that an electric light plant will be in operation in a fortnight.

Aurora, Ill.—A company is being organized at Aurora, Ill., to put in an Edison electric light plant. The capital stock will be $50,000, which will provide for the running of 1,500 to 2,000 lights of 16 candle-power each.

Cheap Siemens Dynamos.—Messrs. Siemens Brothers, of London, England, are about to introduce a new type of dynamo at much cheaper prices than have hitherto been offered for generators of equal capacity.

Calling for More Engines.—The Jarvis Engineering Company, Boston, have sold a third Armington & Sims engine to the Fall River Electric Light Company, and another 90 h. p. engine of same make to the New Haven Electric Light Company.

Building by Night.—Arrangements have been made for working nights upon the new buildings of the Manchester, N. H., Print Works, by the aid of electric lights, and it is expected that the works will be started up under full headway the Monday after Thanksgiving.

Roxbury, Mass.—The Westinghouse Electric Company, of Pittsburgh, Pa., has completed the installation of a 500 16 c. p. incandescent light plant at the factory of the Sewall & Day Cordage Company, at Roxbury. The lights will probably be started up this week.

The Jacksonville Gas Company, which has been using a combined American arc and an Edison incandescent system for the past year, are now largely increasing their present facilities with a view to doubling their electric plant. This gas company is acting as general agent for the American Company in Florida.

A New Westinghouse Station.—The Brush Electric Light Company of Buffalo have just ordered two more 60 h. p. Westinghouse engines, making 18 in all now running in a single room. Westinghouse, Church, Kerr & Co. are also constructing for them an incandescent central station on the Westinghouse system.

Equipping New Stations.—The work of installing the plants for the Natick, Mass., Electric Light Company, Newton, Mass., Electric Light Company, Waltham, Mass., Electric Light Company, and the Suburban Electric Light Company, of Brookline, Mass., has been intrusted to the Jarvis Engineering Company, who are also enlarging the New Haven and Woonsocket plants.

Misunderstanding in Brooklyn.—The war over the erection of telegraph and electric light poles in Brooklyn has led the Subway Commissioners of that city to inquire from Corporation Counsel Jenks what authority they have to compel the various telephone, telegraph and electric light companies to place their wires in the conduits now being built. The Common Council has been authorizing the lighting of certain streets by electricity for more than a year, and during that time many miles of wire have been strung.

The Westinghouse Company.—At a meeting of the stockholders of the Westinghouse Electric Company, held week before last, it was voted to increase the capital stock of the company to $5,000,000, and to purchase from Mr. George Westinghouse, Jr., the exclusive right to the Gaulard and Gibbs invention, the patent for which was recently issued, and which was announced generally throughout the press, leaving $1,000,000 of stock in the treasury for sale at par. Preparations are being made at the works to manufacture apparatus necessary for 2,000 to 3,000 lights per day.

APPLICATIONS OF POWER.

In a Steam Pump Works.—Apparatus has arrived at the Knowles Steam Pump Works, Warren, for lighting the new machine shop building by electricity.

The Edgerton Electric Motor Company, of Camden, N. J., has been incorporated with a capital stock of $500,000. Nathan H. Edgerton, and others, incorporators.

Electric Railway Company.—The Bidwell Electric Railway and Manufacturing Company, Chicago, Ill. Capital stock, $100,000. Charles F. Bidwell, and others, incorporators.

The Kelly Insulating and Manufacturing Company has been incorporated at Chicago, Ill., with a capital stock of $500,000. George Kelly and others are the incorporators.

A novel plant has just been built by the Brush Electric Company for the Denver Tramway Construction Company. It consists of a primary generating machine of 100 h. p., and five electric motors of 12 h. p. each. The plant is to be used to operate a street railway in Denver, Col., the system of conductors employed being Professor Short's. Professor Short went to Cleveland and conducted the trial of the plant with Mr. Brush. At the conclusion of the trials he gave the company an unqualified acceptance, and the plant has been shipped to Denver.

Elevator Run by Daft Motor.—The elevator in the Howard National Bank Building in Boston, which was put in by the Whittier Machine Co., runs at the rate of 200 feet a minute. The elevator is of the hydraulic pattern, and a Daft motor run from the circuits of the Massachusetts Electric Power Company maintains a pressure of 75 pounds in the tanks. When that pressure is reached the motor stops automatically, starting again gradually when the pressure sinks below the standard. All the arrangements are automatic.

PERSONAL.

Mr. Park Benjamin is not altogether an advocate of lighting the Statue of Liberty. He says: "Perhaps further experimenting will reveal a way out of the difficulty, but does the necessity for lighting the image warrant this or any other expense? If, therefore, the statue is of no use as a beacon, and if to light it from the outside involves a metaphorical absurdity as well as no small measure of cost and trouble, why resume the light? There is already a bronze flame on the torch. Why have a real one, too? Why duplicate the mixed realism of the Angel of the Waters at the park? Or, if in this ultra-realistic age, realism in all things, so far as may be possible, is indispensable, let us at least have some uniformity about it, and proceed to provide the bronze Daniel Webster with a real swallow-tail, the bronze Lincoln with real inexpressibles, and the bronze Indian Hunter with a real dog."

MISCELLANEOUS NOTES.

The National Subway Company, of Chicago, has been incorporated with a capital stock of $500,000. Frank A. Hicks and others, incorporators.

Imitating Leather.—By means of electricity the most attractive leather surfaces are now completely imitated. The leather which it is destined to imitate is first well cleaned and coated with graphite, as in electroplating a smaller article. It is then placed in a copper bath, the tank of which is made large enough to easily receive a skin of any size. A powerful dynamo-electric machine furnishes the current. The copper is deposited upon the coated surface of the hide to the thickness of one-sixteenth to one-eighth of an inch. The plate thus formed reproduces, but reversed, every mark and minute vein of the leather, so that a print taken from it is an exact copy of the original.

Newspaper Messages.—The telegraph wires have become in our day things of vulgar access, whereas I was a good while on a newspaper before I ever had occasion to use the wires at all, says George Alfred Townsend in *Lippincott's* for November. When Abraham Lincoln made his celebrated speech at Trenton, where he affirmed for the first time that he would resist the disunionists, I took it to the telegraph office and felt almost like a culprit when I sent it over the wires, though it was hardly five minutes long. At the present time I often send 8,000 to 12,000 words over distances of 1,000 to 4,000 miles—say, from Chicago to Boston, New York, Cincinnati and California—and the matter gives no more concern than when, in 1861, some real battle would come into the editorial room and you would hear the editor exclaim that there would be the devil to pay next morning down stairs, meaning when the publishers got the bills. I have known men of enterprise, at the commencement of my experience, to be turned off the newspapers, not for sending too little matter, but for sending too much, whereas, in our time, to send too little is an offense nobody will overlook.

SPARKS AND FLASHES.

The Messenger Boy Again.—A French physician says the healthiest way to sleep is to have the heels higher than the head. The girl with the French heels ought to sleep like a messenger boy, then.—*Yonkers Statesman.*

A Mystery Explained.—Now we know whence the electric girl originated. A clay pit has been discovered in Georgia which is almost solid electricity. It was of course out of this clay that Lulu Hurst was fashioned.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver steel and iron wire, shafting tools, etc.

A Glowing Tribute.—Messrs. Lord & Taylor, the great dry-goods house of this city, are using a 65-light plant of the American Electric Manufacturing Co. in their Grand street store, with which they are greatly pleased. They write as follows regarding it: "We cheerfully reply to your request for information as to the workings of the electric light plant put in our establishment by your company. It is true in its action, is easily managed, and does not get out of order or give trouble to the engineer having it in charge. It is a steady and as good an arc light as we have ever seen or used. Your automatic regulator is a great invention, and gives an easy control of the lamps that is of infinite value. Your system seems to us to combine all the elements of the best work with economy of power and simplicity of construction."

Anti-Magnetic Shields.—Messrs. Giles Bros. & Co., Chicago, Ill.: Gentlemen: Your Anti-Magnetic Shield for Watches cannot be overestimated. It is now very near eight months that I have worn my watch, and to-day it is, without ever correcting time, about one minute slow. Considering the fact that I am every day near Dynamo-Electric Machines in our regular business, the test could not be harder. I could never have believed that the protection was so complete.

In this age of electricity, not only electricians, but every one who needs correct time, should have the Anti-Magnetic Shield. A good deal of practical utility, as well as pleasure, can be derived from a good time-keeper. At present I look upon a watch without a shield as a thing incomplete; and so it is.

Very respectfully, CHAS. J. VAN DEPOELE.
Electrician V. D. P. E. M. Co.

Address GILES BRO. & Co., for particulars, price, etc.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

November 22, 1886.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	.....	40
Am. Tel. & Cable	77	78½
Cen. & So. Am.	75	100
*Com. Tel.	.....	104
*Gold & Stock	92½	97½
*Inter. Ocean Tel.	90	97
N. Y. Mutual	.....	.....
Pac. & Atl.	45	55
*Postal T. & C.	15	.....
South. & Atl.	65	75
W. U. Tel.	78¾	78⅞
W. U. Scrip.	70	72
W. U. Bonds	122	.....
Mut. U. Bonds	85	85½
TELEPHONE.		
Am. Bell	207½	208
Am. Speaking	110	125
Erie	28	.....
*Hudson River	.....	55

TELEPHONE.	Bid.	Asked.
Mexican	1¾	2
*N. Y. & N. J.	85	.....
N. Y. & Pa.	.....	.....
New England	44	44¼
*Southern Bell	100	130
ELECTRIC LIGHT.		
*Am. Electric	.....	.....
*Brush	.....	.....
*Brush Ill	90	.....
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	130	.....
*Edison Ill	85	100
*Edison Isolated	.....	.....
*United States	40	.....
*U. S. Ill	90	100
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

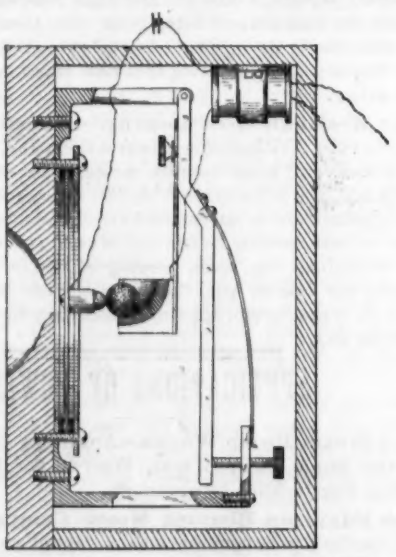
PATENTS DATED NOV. 9, 1886.

352,119. Telephone Transmitter; William H. Collins, Chicago, Ill. Application filed May 10, 1886. Improvement on patents Nos. 258,757 and 314,841.

352,154. Electrical Door-opener; David Rousseau, New York, N. Y. Application filed December 26, 1885. [See illustrations.]

352,167. System of Motors for Electric Railway Brakes; Charles Van Depoele, Chicago, Ill. Application filed June 16, 1886. The object is to arrange the controlling switches of the motors and brakes, so that they will be under the control of a single operator

(1) 352,176. Telephone Transmitter; (2) 352,177. Telephone Transmitter; (3) 352,178. Telephone Transmitter; (4) 352,179. Telephone Transmitter; James W. Bonta, Philadelphia, Pa. Applications filed March 11, 1886. The inventions relate in common to telephonic transmitters in which an electrode is fixed to the diaphragm and the opposite electrode is a ball supported upon an inclined table,



352,179. TELEPHONE TRANSMITTER.

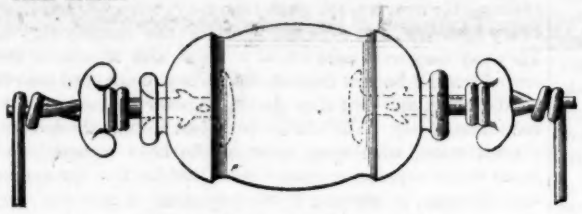
means being provided for varying the original contact pressure, usually by adjusting the inclination of the table. (1) The object is economy in the first cost of the instrument. The improvement provides also for varying the initial contact pressure without altering the inclination of the table. (2) The object is to provide easy access to the electrodes and table for adjusting the height of the latter. (3) The object is to provide a table capable of being elevated or depressed, and, if desired, moved toward or away from the diaphragm. (4) The table is provided with tension devices for varying the pressure. [See illustration.]

352,203. Electric Safety Attachment for Steam Boilers; Robert Reichling, Prussia, Germany. Application filed March 11, 1886. The invention relates to various details, the general object being to sound an alarm whenever the water in the boiler reaches a predetermined minimum height, a fusible alloy being employed.

352,234. Electro-Magnetic and Magneto-Electric Machine; Rudolf Eickemeyer, Yonkers, N. Y. Original application filed Nov. 8, 1882. Divisional application filed Oct. 23, 1885. [For a description of the general features of this invention, see illustrated patent record of THE ELECTRICAL WORLD, Nov. 20, 1886.]

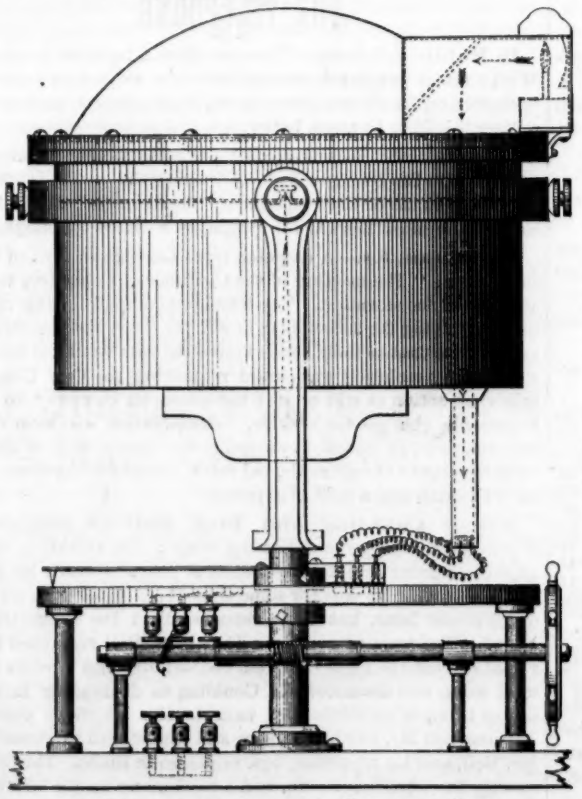
352,265. Electric Railway; Elias E. Ries, Baltimore, Md., Assignor by direct and mesne assignments to Edw. O. Punchard, of Boston, Mass. Application filed Jan 9, 1886. [For description, see page 258, this issue.]

352,317. Telegraph Sounder; Charles D. Haskins, Brooklyn, N. Y., Assignor to the Western Electric Co., Chicago, Ill. Application filed June 22, 1886. Relates to means for supporting the armature lever on a flat torsion spring, and various other details.



352,427. ELECTRIC INSULATOR.

352,320. Secondary Electric Clock; John F. Hedge, Jr., Providence, R. I., Assignor to the Synchronous Time Co., Boston, Mass. Application filed Aug. 17, 1886. The invention is especially directed to providing means whereby the clock movement shall be securely locked between the actuating electric impulses sent by the primary clock.



352,734. APPARATUS FOR STEERING SHIPS.

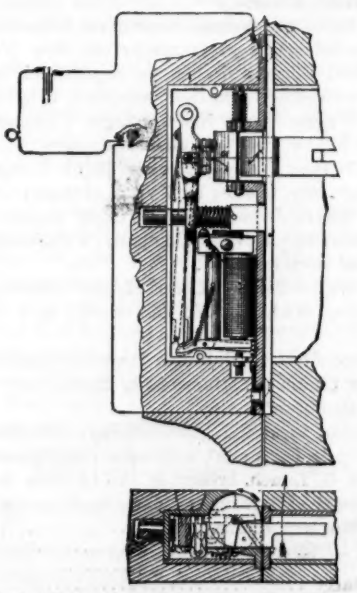
352,324. Galvanic Battery; John William Hoffman, Pullman, Ill. Application filed Feb. 8, 1886. The object is to improve and simplify the construction of the Leclanché battery.

352,342. Protector for Electric Wires and Instruments; George W. Mingle and William T. Brown, Philadelphia, Pa., Assignors to said William T. Brown. Application filed April 2, 1886. With currents slightly in excess of the normal, and lasting but a few moments at an abnormal degree, the circuit is first broken and then restored; but with heavy and continuous abnormal currents the circuit is permanently broken.

352,374. Apparatus for Steering Ships; James A. Tilden, Hyde Park, Assignor of one-half to Hersey Brothers, South Boston, Mass. Application filed Aug. 19, 1880. The operating circuits of the steering apparatus are controlled by the ship's compass-needle, which has attached to it a slitted card. When the ship's course deviates from that which it is set to hold, the slit is brought into line with a selenium or other sensitive cell, thereby closing an electric circuit and moving the rudder. [See illustration.]

352,435. Printing Telegraph System; John C. Wilson, Boston, Mass. Application filed Jan. 4, 1886. The object of the invention is to provide suitable instruments and arrangement of circuits whereby stock quotations may be transmitted over a main line, and at sub-stations along the line be automatically repeated so that they may be received on one or more stock tickers placed in the vicinity of each sub-station.

(1) 352,436. Electric Insulator; (2) 352,437. Electric Insulator; Henry D. Winton, Wellesley Hills, Mass. Applications filed Sept. 10, 1884, and Oct. 18, 1886, respectively. (1) The insulator is constructed so as to shed rain, and so that in case of being broken its parts will be held together and the supported wires will be prevented from falling to the ground. (2) The object is to furnish easy means for looping lamps or telephones into circuit. [See illustration].



352,154. ELECTRIC DOOR OPENER.

(1) 352,472. Electric Bell and Alarm; (2) 352,473. Electrical Gas Lighter; (3) 352,474. Electric Device; Adam Lungen, New York, N. Y. Applications filed Jan. 26, 1886. (1) The improvements relate to a case for the operating parts of an electro-magnetic bell with a view to keeping out dust and insects. (2) The invention is adapted for use with the class of gas burners known as "candle burners." (3) The invention is a fastener for switches and contact buttons, and is designed to be used instead of threaded nuts or pins to hold in place rods, shafts, or bolts upon which are mounted swinging switch arms or contact buttons.

352,486. Galvanic Battery; Wm. R. Patterson, Chicago, Ill., Assignor to the Western Electric Co., same place. Application filed May 24, 1886. [For description, see page 260, this issue.]

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.